EFFECTS OF CREW RESOURCE MANAGEMENT PRACTICES ON AVIATION SAFETY: A CASE OF LOW-COST CARRIER AIRLINES IN KENYA

BY

PRIYA MOHAN RAMCHANDANI

A RESEARCH PROJECT SUBMITTED TO THE SCHOOL OF BUSINESS AND ECONOMICS IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF EXECUTIVE MASTERS IN BUSINESS ADMINISTRATION

MOI UNIVERSITY

2023

DECLARATION

Declaration by Candidate

This research project is my original work and has not been presented for a degree in this or any other university. No part of this research project may be reproduced without the prior written permission of the author/or University.

Signature .... Date ....

Priya Mohan Ramchandani

EASA/EMBA/0217/22

Declaration by the Supervisors

This research project has been submitted for assessment with my approval as University supervisor.

Sign:____________________________________ Date:__________________________

Dr. Yusuf Kibet

Department of Marketing and Logistics

School of Business and Economics

Moi University

Sign:____________________________________ Date:__________________________

Dr. Stephen Chelogoi

Department of Accounting and Finance

School of Business and Economics

Moi University

DEDICATION

I dedicate this research to my parents Mohan and Meena Ramchandani for their support love and encouragement during the entire stage of my academic and research writing phase.

ACKNOWLEDGEMENT

I would like to express our sincere appreciation to all the individuals who have supported me throughout the development of this research report. I would like to thank my supervisors Dr. Y. Kibet and Dr. Stephen Chelogoi for providing me with valuable guidance, insightful feedback, and unwavering support throughout this process.

I would like to acknowledge the support of the management team particularly the library staff, who granted me permission to conduct the study at the library facility, and provided me with necessary resources and data for the research. I would like to thank my friends and family for their encouragement and support throughout this research report development process.

Finally, we would like to acknowledge in advance the contribution of all the participants in the airlines who will take part in the research and provide me with valuable data. Thank you all in advance for your support and contributions.

ABSTRACT

In the aviation industry, safety is paramount. Achieving and maintaining high levels of safety performance is a complex endeavor that requires adherence to regulatory compliance. However, an auditing report conducted by the Kenya Civil Aviation Authority (KCAA) in 2022 revealed significant safety concerns related to the CRM practices of low-cost carriers, specifically highlighting deficiencies in the implementation and effectiveness of CRM within these airlines. This raises alarms about potential risks to aviation safety. The purpose of the study was to investigate the role of crew resource management practices in enhancing aviation safety performance. The study focused on the following objectives: to ascertain the effect of Crew training on aviation safety performance in Low-cost carrier airlines; to establish the effect of error management on aviation safety performance in Low-cost carrier airlines; to determine how crew composition affected aviation safety performance in Low-cost carrier airlines, and to examine the effect of teamwork on aviation safety performance in Low-cost carrier airlines. The theories underpinning the research are Human Factors Theory, High Reliability Theory, Organizational Learning Theory, and safety culture theory. Explanatory research design was adopted for the study to provide meaningful insights on the topic. Census approach was adopted for the study. The study targeted a total of 320 respondents with the sample size of 224 finally arrived at. Closed ended questionnaires were used to collect data and the validity and reliability of this tool were tested through pilot study. Both descriptive and inferential statistics were used. The findings of the study revealed that there was a positive significant relationship between air safety performance and management support for training ($\beta = 0.140$, $p = 0.044$, <0.05). Moreover, it was established that error management has no significant effect on safety aviation performance ($\beta = 0.078$, $p = 0.374$, >0.05). The study also found out that crew composition has no significant effect on safety aviation performance ($\beta = 0.108$, $p = 0.195$, >0.05) and it was established that teamwork has a significant effect on safety aviation performance ($\beta = 0.158$, $p = 0.014$, <0.05). The research findings suggest that crew training, teamwork, and error management are crucial factors that positively influence aviation safety performance. It is the recommendation of this study that CRM training for flight attendants is a valuable tool for increasing positive teamwork behaviors between the flight attendant and pilot sub-groups. It is also recommended that additional studies to be conducted on the factors influencing air safety of performance management systems in Kenya.

TABLE OF CONTENTS

DECLARATION ii

DEDICATION iii

ACKNOWLEDGEMENT iv

ABSTRACT v

TABLE OF CONTENTS vi

LIST OF TABLES x

LIST OF FIGURES xi

ABBREVIATIONS AND ACRONYMS xii

OPERATIONAL DEFINITION OF TERMS xiii

CHAPTER ONE 1

INTRODUCTION 1

1.0 Introduction 1

1.1 Background of the Study 1

1.2 Problem of the Study 6

1.3 General objectives 9

1.3.1 Specific Objectives 9

1.4 Research Hypotheses 9

1.5 Significance of the Study 10

1.6 The Scope of the Study 11

CHAPTER TWO 12

LITERATURE REVIEW 12

2.0 Introduction 12

2.1 Conceptual Review 12

2.1.1 The Concept of Aviation Safety Performance 12

2.1.2 The Concept of Crew Resource Management 14

2.1.3 The concept of Low Cost Carrier airline 15

2.2 Theoretical Framework 18

2.2.1 Human Factors Theory 18

2.2.2 High Reliability Theory 20

2.2.3 Organizational Learning Theory 22

2.2.4 Safety Culture theory 25

2.3 Empirical Review 27

2.3.1 Crew training and aviation safety 27
2.3.2 Team work and aviation safety 30
2.3.3 Crew composition and aviation safety 32
2.3.4 Error management and aviation safety in Aviation institutions 35
2.4 Conceptual Framework 38
CHAPTER THREE 39
RESEARCH METHODOLOGY 39
3.0 Introduction 39
3.1 Research Design 39
3.2 Target Population 39
3.3 Sampling Technique 40
3.4 Research Instruments 41
3.5 Pilot Study 41
3.5.1 Validity of the instruments 42
3.5.2 Reliability 43
3.6 Data Collection Procedure 44
3.7 Measurement of Study Variables 44
3.7.1 Aviation Safety Performance (Dependent Variable) 44
3.7.2 Crew Resource Management (CRM) Practices (Independent Variable): 45
3.8 Data Analysis 47
3.9 Regression model 47
3.10 Assumptions of Regression 48
3.10.1 Normality of Errors 48
3.10.2 Multicollinearity Test 48
3.10.3 Test for Autocorrelation 48
3.10.4 Test for Homogeneity of Variance 49
3.11 Ethical Considerations 49
CHAPTER FOUR 51
RESEARCH FINDINGS, ANALYSIS AND INTERPRETATION 51
4.0 Introduction 51
4.1 Preliminary Screening and Preparation 51
4.1.1 Data Process 51
4.1.2 Missing Data 52
4.1.3 Response Rate 52

4.1.4 Test for Outliers 53
4.1.5 Reliability 54
4.1.6 Validity of Instruments 55
4.2 Testing Statistical Assumptions 60
4.2.1 Normality Test 60
4.2.2 Multicollinearity Test 62
4.2.3. Test for Autocorrelation 63
4.2.4 Test of Homogeneity of Variance 64
4.3 Sample Characteristics 64
4.4 Descriptive Statistics 66
4.4.1 Descriptive Statistics of Safety Aviation Performance 66
4.4.2 Descriptive Statistics of Crew Training 68
4.4.3 Descriptive Statistics of Error Management 70
4.4.4 Descriptive Statistics of Crew Composition 71
4.4.5 Descriptive Statistics of Team Work 73
4.5 Correlation Analysis 75
4.6 Multiple Regression Analysis 77
4.7 Hypotheses Testing 84
4.7.1 Test for Direct Effects 84
4.8 Summary of Hypotheses Testing Results 87
CHAPTER FIVE 89
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS 89
5.1 Introduction 89
5.2 Summary of Findings 89
5.2.1 Effect of Crew Training on Aviation Safety Performance 89
5.2.2 Effect of Error Management on Aviation Safety Performance 90
5.2.3 Effect of Crew Composition on Safety Performance 90
5.2.4 Effect of Team Work on Aviation Safety Performance 91
5.3 Conclusion of the Study 92
5.4 Limitations of the Study 94
5.5 Recommendation of the Study 95
5.5.1 Practice and Management 95
5.5.2 Recommendations on Policy 96
5.5.3 Theoretical Implications 96

5.6 Recommendation for Further Studies 97
REFERENCES 98
APPENDICES 101
Appendix I: Questionnaire 101
Appendix II: SPSS Output 107
Appendix III: Plagiarism Similarity Index 111

LIST OF TABLES

Table 3.1: Target Population Distribution....40
Table 3.2: Operationalization of Study Variables....46
Table 4.1: Response Rate Questionnaire....53
Table 4.2: Test for Outliers....54
Table 4.3: Reliability Coefficients of Study Constructs....54
Table 4.4: KMO and Bartlett's Test for Validity....56
Table 4.5: Total Variance Explained....56
Table 4.6: Communalities....57
Table 4.7: Rotated Component Matrix....60
Table 4.8: Normality Test....62
Table 4.9: Multicollinearity Test....63
Table 4.10: Autocorrelation Test....64
Table 4.11: Test of Homogeneity of Variance....64
Table 4.12: Demographic Characteristics....65
Table 4.13: Descriptive Statistics of Safety Aviation Performance....67
Table 4.14: Descriptive Statistics on Crew Training....69
Table 4.15: Descriptive Statistics on Error Management....71
Table 4.16: Descriptive Statistics of Crew Composition....72
Table 4.17: Descriptive Statistics on Team Work....74
Table 4.18: Correlation Analysis Results....76
Table 4.19: Model Summary [b]....77
Table 4.20: ANOVA[a]....79
Table 4.21: Regression Coefficients[a]....80
Table 4.22: Coefficient Results for Direct Effect....85
Table 4.23: Summary of Hypotheses Testing Results....87

LIST OF FIGURES

Figure 2.1: Conceptual Framework Diagram 38
Figure 4.1: Scree Plot.. 59
Figure 4.2: Normality Test.. 61

ABBREVIATIONS AND ACRONYMS

AFCAC: African Civil Aviation Commission

AFRAA: African Airline Association

ATC: Air Traffic Control

HRT: High Reliability Theory

IATA: International Air Transport Association

ICAO: International Civil Aviation Authority

IT: Information Technology

LCC: Low Cost Carrier airlines

OLT: Organizational Learning Theory

OPERATIONAL DEFINITION OF TERMS

Crew composition: refers to the makeup and characteristics of the individuals who form a crew or team in a specific context or industry, such as aviation, maritime, or healthcare. It encompasses factors such as the skills, qualifications, experience, roles, and diversity of the crew members (Vansteenkiste, 2019).

Crew training: refers to the process of providing education, instruction, and development opportunities to individuals who work in a crew or team environment, such as in aviation or maritime operations. It is designed to enhance the knowledge, skills, and competencies of crew members, including pilots, flight attendants, and other personnel, to ensure safe and efficient performance in their respective roles (Babbie, 2016).

Error management: refers to the systematic approach and strategies employed to identify, prevent, detect, and respond to errors within an organization or system. It involves recognizing that errors are an inherent part of complex systems and focusing on managing and minimizing their impact rather than attributing blame to individuals (Button, 2017).

Low Cost Carrier Airline: A low-cost carrier airline offers affordable air travel by minimizing traditional services and amenities while focusing on efficiency and point-to-point routes (Borenstein, 2014).

Team work: refers to the collaborative efforts and coordinated actions of the pilot and other crew members involved in operating an aircraft. It encompasses the effective communication, coordination, and cooperation among team members to ensure the safe and efficient conduct of flights (Grosling, 2018).

CHAPTER ONE

INTRODUCTION

1.0 Introduction

This chapter comprises of the background of the study, problem statement, research objectives, research hypotheses, significance of study and the scope of study.

1.1 Background of the Study

Aviation safety performance is a critical aspect of the global aviation industry (Borenstein, 2014). Ensuring the safety of passengers, crew members, and the public is of paramount importance for aviation organizations worldwide. Over the years, significant efforts have been made to enhance safety performance through advancements in technology, improved regulations, robust safety management systems, and comprehensive training programs. Globally, the aviation industry has achieved remarkable improvements in safety performance (Charles, 2019). The International Civil Aviation Organization (ICAO), a specialized agency of the United Nations, plays a central role in promoting and coordinating aviation safety on a global scale. Through the development and implementation of international standards and recommended practices, ICAO has established a solid foundation for safety management systems and regulatory frameworks.

From a global perspective, the implementation of CRM principles has had a profound impact on aviation safety performance. International bodies such as the International Civil Aviation Organization (ICAO) have emphasized the importance of CRM in their safety guidelines and recommendations (Koestner, 2019). By focusing on effective communication, teamwork, decision-making, and situational awareness among crew members, CRM has contributed to reducing accidents, incidents, and operational errors globally.

In the African regional context, the effects of CRM on aviation safety performance are particularly relevant. The African aviation industry has witnessed significant growth and development in recent years, with increased air traffic and operational complexities (Koo, 2018). CRM plays a crucial role in addressing these challenges and enhancing safety measures. Regional organizations like the African Civil Aviation Commission (AFCAC) and the African Airlines Association (AFRAA) actively promote CRM and work towards its integration into the operations of African airlines. This regional perspective emphasizes the need for effective collaboration, standardized procedures, and training programs to enhance CRM implementation and improve safety outcomes.

At the local level in Kenya, CRM is vital for ensuring aviation safety within the country's aviation industry. The Kenya Civil Aviation Authority (KCAA) recognizes the importance of CRM and has incorporated CRM principles into their regulations and guidelines (Najar, 2017). Kenyan airlines, aviation organizations, and training institutions prioritize CRM training and implementation to foster a safety-conscious culture. By investing in CRM programs and establishing reporting mechanisms, the local aviation stakeholders aim to enhance communication, teamwork, and situational awareness among crew members, ultimately improving aviation safety performance.

In Kenya, CRM practices are integrated into pilot training programs, crew resource management practices courses, and standard operating procedures. This local perspective acknowledges the significance of CRM in preventing accidents, managing risks, and ensuring safe and efficient operations. Kenyan airlines place great importance on fostering a culture of open communication, mutual trust, and effective teamwork among their crew members (Stanley, 2016). By doing so, they enhance crew coordination, decision-making, and error management, leading to improved aviation safety performance.

Crew Resource Management (CRM) is a fundamental aspect of aviation safety, focusing on effective communication, coordination, and decision-making within the flight crew (Cate, 2021). Recognizing its significance, the International Civil Aviation Organization (ICAO) has developed and recommended specific guidelines and practices for CRM implementation. ICAO recognizes CRM as a critical element in mitigating human error and improving the overall safety performance of aviation operations (Babbie, 2016). In its document "Manual on the Implementation of ICAO Language Proficiency Requirements," ICAO provides guidance on CRM, emphasizing the importance of teamwork, communication, and coordination among crew members. This thesis on effect of crew resource management on aviation safety performance explores the state of safety performance in aviation, with special emphasis in crew training, error management, crew composition and team work.

Crew training is essential in enhancing aviation safety performance through various means. It provides comprehensive technical knowledge, enabling crew members to identify risks and make informed decisions (Caspari, 2015). Training fosters proactive risk management, promoting the identification and mitigation of hazards. Effective communication and coordination skills acquired through training enhance crew functioning, reducing errors and misunderstandings. Training also enhances situational awareness, enabling proactive responses to potential threats. Lastly, training prepares crew members for emergencies, developing the necessary skills and resilience to handle high-stress situations (Makhanya, 2020). Continued investment in crew training is vital for maintaining the highest levels of safety in the aviation industry.

Crew members who receive training in teamwork and communication exhibit fewer communication errors and are better able to coordinate their actions, contributing to safer operations (Wiegmann et al., 2016). Training programs that enhance situational awareness have demonstrated a positive impact on safety.

Error management plays a critical role in enhancing aviation safety performance (Najar, 2017). In the aviation industry, where even minor errors can have significant consequences, effectively managing errors is essential to prevent accidents and ensure the well-being of passengers and crew members. Error management in aviation involves multiple stages that contribute to enhancing safety performance (Stanley, 2016). The process begins with error recognition, where personnel are trained to identify errors and deviations from expected performance. Error analysis then delves into understanding the underlying factors behind the error, including human and systemic elements. Error mitigation focuses on proactive measures to minimize error impact, such as process improvements and additional training (Odukoya, 2017). Reporting and feedback mechanisms foster a non-punitive culture, encouraging individuals to report errors and enabling organizational learning. Ultimately, continuous improvement integrates lessons learned into preventive measures, driving ongoing safety enhancements. Error management in aviation involves multiple stages that contribute to enhancing safety performance. Stanley (2016) outlines that personnel trained to identify errors exhibit better performance in aviation safety.

Crew composition is crucial in enhancing aviation safety performance as it influences effective communication, coordination, and decision-making within the flight crew. A well-composed crew ensures a balanced allocation of tasks, taking into account individual strengths and expertise. Diversity within the crew brings different perspectives and problem-solving approaches, leading to improved situational awareness and error management (Jorgensen, 2015). Crew resource management (CRM) principles and practices, including effective communication and teamwork, should be integrated to maximize the benefits of crew composition and create a safer aviation environment. Empirical evidence supports the link between crew composition and aviation safety performance. Studies, such as the one conducted by Jorgensen (2015), highlight the importance of crew composition in facilitating effective communication, coordination, and decision-making within the flight crew. When crew members are assigned tasks that align with their skills and knowledge, it promotes efficient teamwork and reduces the likelihood of errors or misunderstandings.

Organizational culture plays a crucial role in enhancing aviation safety performance by prioritizing safety as a core value and embedding it in decision-making processes and operational practices (Jorgensen, 2015). A positive culture encourages open communication and reporting, fostering a proactive approach to safety by enabling the identification of risks and timely corrective actions. It also nurtures trust and psychological safety, creating an environment where individuals feel safe to report safety concerns and contribute to collective vigilance (Kirschenbaum, 2018). Moreover, teamwork and collaboration are emphasized in a safety-oriented culture, promoting clear communication, situational awareness, and effective decision-making among team members (Laaser, 2018). Continuous learning and improvement are valued, encouraging employees to engage in ongoing training and implement lessons learned from incidents, ensuring the organization stays updated with evolving safety practices. Leadership plays a pivotal role in driving safety performance by prioritizing safety, setting an example, and holding individuals accountable for their safety-related actions. Studies, such as the one conducted by Jorgensen (2015), emphasize the importance of embedding safety into the organizational culture. This involves ensuring that safety is integrated into decision-making processes, operational practices, and daily routines.

Crew Resource Management plays a critical role in enhancing aviation safety performance. By promoting effective crew training, team work, crew composition and error management, CRM ensures that flight crews are well-prepared to handle the complexities and challenges of aviation operations. It is an indispensable part of aviation training and operations, enabling crews to work together seamlessly and make informed decisions in real-time. CRM's focus on safety culture and continuous learning drives improvements in aviation safety, ensuring that the highest level of safety is maintained in the industry.

1.2 Problem of the Study

The imperative of ensuring and continuously improving the aviation safety performance of low-cost carriers’ stands as a paramount and pressing concern in the dynamic landscape of air transportation. Despite the expectations for Safarilink, JamboJet and Skyward, as prominent low-cost carriers in Kenya airlines to uphold high standards in safety, recent findings from a 2022 audit conducted by the Kenya Civil Aviation Authority (KCAA) raised significant concerns regarding the implementation and effectiveness of Crew Resource Management (CRM) practices within these carriers. The audit identified deficiencies that warrant a closer examination of the current status of aviation safety performance in these airlines, supported by statistical evidence and real-world examples.

In a wide-ranging audit report by IATA (2020) on aviation safety performance among Kenyan low-cost carriers, the statistical analysis yielded illuminating figures that brought to light the challenges faced by Safarilink, JamboJet, and Skyward Airline. The research uncovered a 23% increase in communication-related incidents during high-frequency flight operations, emphasizing the critical role of Crew Resource Management (CRM) in maintaining effective communication channels. Moreover, the study showcased a direct correlation between crew experience levels and safety outcomes, with a notable 15% rise in reported safety incidents associated with less experienced crew members. Alarming figures also indicated a 12% increase in instances of decision-making challenges during rapid turnarounds, underscoring the impact of operational demands on CRM effectiveness.

Low-cost airlines operating in Kenya confront significant challenges in implementing effective Crew Resource Management (CRM) practices, directly impacting aviation safety performance. The constrained allocation of resources to crew training programs, a consequence of stringent budgets, may lead to inadequate training and a diminished emphasis on CRM principles (Babbie, 2016). This limitation can obstruct effective communication, teamwork, decision-making, and situational awareness among crew members, posing potential risks to safety and compromising overall aviation safety performance. The prevalent cost-focused culture of low-cost airlines, geared toward maintaining competitive fares, inadvertently diminishes the emphasis on safety considerations, thereby presenting challenges in cultivating a robust safety culture within the organizational framework.

Crew composition stands out as a pivotal factor influencing CRM effectiveness within low-cost carriers, directly affecting aviation safety performance (Cate, 2021). The employment of less experienced crew members, a common practice in low-cost airlines compared to traditional counterparts, can impact their proficiency in handling intricate and dynamic situations. Insufficient experience may impede the effective implementation of CRM, particularly in decision-making, situational awareness, and communication, directly influencing aviation safety performance. The demanding operational nature of low-cost airlines, characterized by high flight frequencies and rapid turnarounds, further contributes to crew fatigue and burnout, compromising the overall effectiveness of CRM practices and, subsequently, aviation safety performance.

Effective error management, an integral aspect of the CRM framework, faces challenges in low-cost airlines due to potential hindrances in fostering a robust reporting culture (Button, 2017). Concerns related to job security and fear of blame may impede the identification, reporting, analysis, and mitigation of errors or potential hazards in aviation operations. This directly impacts aviation safety performance by limiting the proactive management of safety-related issues.

While empirical studies have extensively explored the positive influence of CRM on aviation safety performance in legacy airlines in developed countries, the empirical evidence for low-cost airlines in Kenya, including Safarilink, JamboJet, and Skyward Airline, remains limited. Understanding the specific impact of CRM on aviation safety performance is crucial for addressing the unique challenges faced by low-cost carrier airlines in Kenya and improving safety outcomes in their operations. Therefore, there is a compelling need for further empirical research to bridge this gap and provide insights tailored to the distinctive challenges faced by low-cost carrier airlines in Kenya, directly contributing to the enhancement of aviation safety performance.

Addressing these challenges and research gaps, this study aims to contribute to the understanding of how CRM practices can enhance aviation safety performance within low-cost airlines in Kenya, with a specific focus on Safarilink, JamboJet and Skyward Airline as a case study.

1.3 General objectives

This study endeavored to assess the role of crew resource management in enhancing aviation safety performance; case of Low cost carrier airline.

1.3.1 Specific Objectives

The objective of this study was:

i. To ascertain the effect of Crew training on aviation safety performance in Low cost carriers.

ii. To establish the effect of error management on aviation safety performance in Low cost carriers.

iii. To determine how crew composition affects aviation safety performance in Low cost carriers.

iv. To examine the effect of team work on aviation safety performance in Low cost carriers.

1.4 Research Hypotheses

The following hypotheses guided this research:

Ho_1: There is no significant effect of crew training on aviation safety performance in Low-cost carriers.

Ho2: There is no significant effect of error management on aviation safety performance in Low-cost carriers.

Ho3: There is no significant effect of crew composition on aviation safety performance in Low-cost carriers.

Ho4: There is no significant effect of teamwork on aviation safety performance in Low-cost carriers.

1.5 Significance of the Study

Research on the effects of Crew Resource Management (CRM) on aviation safety performance, specifically focusing on a case study of Low cost carriers Airline, holds significant significance for policy development. The findings of the research can offer insights into the effectiveness of CRM implementation within the airline industry and its impact on safety outcomes. Policymakers can utilize this research to inform the development or revision of policies related to CRM training requirements, standards, and guidelines. The research can help shape regulations that promote the adoption of CRM practices and ensure their consistent implementation across the aviation industry.

Furthermore, the research holds practical implications for the aviation industry, particularly for low cost carrier airlines. By examining the effects of CRM on safety performance within a specific airline, the research can provide valuable information for airline management and operational teams. The findings can help identify areas of improvement in CRM implementation, highlight successful practices, and identify potential challenges or barriers. This information can guide airlines in refining their CRM training programs, optimizing teamwork and communication processes, and enhancing overall safety management systems. It can also assist airlines in allocating resources effectively to improve safety outcomes and reduce human errors.

In addition to its practical implications, the research can contribute to the theoretical understanding of CRM and its impact on safety within the aviation context. By using Low cost carriers Airline as a case study, the research can validate existing theories and frameworks related to CRM and safety, providing empirical evidence to support their applicability. Moreover, the research can generate new insights and perspectives on CRM implementation, identifying factors that contribute to its success or hinder its effectiveness. By adding to the body of knowledge, the research can advance CRM theory and contribute to the development of evidence-based practices in aviation and other industries where CRM principles are applied.

1.6 The Scope of the Study

The study focused on examining the aviation safety performance of Low cost carriers Airlines, with a primary focus on crew members, including pilots, co-pilots, and other relevant staff directly involved in flight operations. It is expected to be conducted within a specific time frame, the duration of which may vary depending on the research design and available resources. The study aims to analyze the effects of Crew Resource Management (CRM) practices on aviation safety performance in Low cost carriers.

To carry out the study, data collection and analysis will take place within the operational environment of Low cost carrier Airlines. This includes various locations such as Safarilink, Jambojet and Skyward bases, operational centers, training facilities, and other relevant areas where crew members perform their duties and receive training. By conducting the study within the airline's operational context, researchers can gain a comprehensive understanding of how CRM practices impact aviation safety performance in real-world scenarios.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This section presents the literature on the four variables of study. It entails literature on the following sub-headings; Crew training, team work, crew composition and error management and how they influence the aviation safety. This chapter also looks at the theories that inform the study and the conceptual framework.

2.1 Conceptual Review

2.1.1 The Concept of Aviation Safety Performance

Aviation safety performance is a paramount concern within the aviation industry, encompassing measures and practices aimed at ensuring the safety of air travel (Zhang, 2017). It involves a comprehensive approach, including safety management systems, regulatory frameworks, training, safety culture, and technology. Safety performance goes beyond accident rates and focuses on proactive measures, risk management, and continuous improvement. Evaluating safety performance through key performance indicators and regular assessments helps identify areas for improvement (Vansteenkiste, 2019).

The literature on aviation safety performance highlights the significance of integrating various factors to achieve optimal safety levels. Borenstein (2014) emphasizes the importance of robust safety management systems in identifying hazards, assessing risks, and implementing effective safety measures, with a notable 20% reduction in identified hazards through proactive management ICAO (2019). Moreover, fostering a positive safety culture within aviation organizations is paramount (Zhang, 2017). A safety culture emphasizes the collective commitment to safety, open communication, learning from mistakes, and encouraging reporting of safety-related concerns.

Organizations with a strong safety culture reported a substantial 30% decrease in safety-related incidents ICAO (2019).

Training and education play a crucial role in enhancing safety performance (Vansteenkiste, 2019). Rigorous training programs have demonstrated a 25% increase in personnel competency, ensuring that aviation professionals remain competent and up-to-date with the latest safety protocols and procedures ICAO (2019). Adherence to regulatory frameworks is another crucial aspect of aviation safety performance (Borenstein, 2014). Governments and international organizations establish safety regulations to ensure standardization and consistency across the industry. Compliance with these regulations has reached an impressive 98%, contributing to maintaining safety standards and promoting a safe operating environment ICAO (2019).

Technological advancements significantly contribute to aviation safety performance (Zhang, 2017). Innovations in aircraft design, navigation systems, and safety equipment have led to a remarkable 40% decrease in accidents attributed to equipment failure (IATA, 2021). Additionally, data-driven approaches, such as predictive analytics and real-time monitoring, have reduced safety risks by an impressive 22% (IATA, 2021).

The aviation industry faces ongoing challenges in maintaining safety performance due to emerging technologies, human factors, regulatory changes, and global connectivity. Despite these challenges, collaborative efforts, sharing best practices, and investing in research and development have resulted in a commendable 10% improvement in safety performance evaluations within the industry (Vansteenkiste, 2019).

2.1.2 The Concept of Crew Resource Management

Crew Resource Management (CRM) is a training concept and set of practices designed to improve communication, teamwork, decision-making, and situational awareness among flight crews. CRM recognizes the critical role of human factors in aviation safety and aims to enhance the non-technical skills of aviation professionals (Coll, 2019). It emerged in response to accidents and incidents that highlighted the importance of effective teamwork and communication within flight crews.

Crew Training: Crew training focuses on providing pilots and crew members with the necessary knowledge, skills, and competencies to effectively carry out their roles and responsibilities (Mesut, 2016). It includes training on aircraft systems, procedures, emergency protocols, communication, and decision-making. The goal of crew training is to ensure that all crew members are equipped with the necessary technical and non-technical skills to handle various operational scenarios and work effectively as a team.

Error Management: Error management involves identifying, preventing, and managing errors or mistakes that may occur during flight operations (Koestner, 2019). It emphasizes creating an environment where crew members feel comfortable reporting errors and near-misses without fear of retribution. Error management involves procedures such as error reporting systems, investigation and analysis of errors, and the development of strategies to mitigate the risk of errors. It also includes promoting a culture of learning from errors and implementing corrective actions to prevent their recurrence.

Crew Composition: Crew composition refers to the selection and assignment of crew members for a specific flight or mission. It involves considering factors such as experience level, skill set, expertise, and compatibility among crew members

(Doganis, 2016). Effective crew composition aims to create a balanced and cohesive team that can effectively communicate, cooperate, and collaborate during flight operations. It takes into account factors such as crew resource allocation, workload distribution, and diversity of skills and backgrounds to optimize crew performance and enhance safety outcomes.

Teamwork: Teamwork in CRM emphasizes the effective collaboration and coordination among crew members to achieve common goals and objectives (Kiernan, 2021). It involves clear communication, mutual trust, shared situational awareness, and efficient decision-making processes. Effective teamwork ensures that all crew members actively contribute to the safe and efficient operation of the aircraft. It includes practices such as briefings, debriefings, cross-checking, task allocation, and effective communication protocols to enhance coordination and cooperation among the crew.

2.1.3 The concept of Low Cost Carrier airline

In the expansive realm of aviation, a disruptive force known as Low-Cost Carrier (LCC) airlines has carved a niche that defies conventional travel norms. The concept of LCCs has revolutionized the way people perceive air travel, offering an alternative model that prioritizes affordability and efficiency. This section delves into the origins, strategies, and impact of low-cost carrier airlines, highlighting their transformative influence on the aviation industry.

The genesis of low-cost carrier airlines can be traced back to the latter part of the 20th century when a handful of pioneering airlines challenged the status quo. Fueled by the idea of democratizing air travel, these airlines sought to strip away unnecessary frills and costs that had long been associated with flying. The cornerstone of the LCC concept lies in providing passengers with the freedom to choose services à la carte, thus allowing travelers to tailor their experience to their preferences and budget.

One of the key strategies adopted by LCCs is the simplification of fare structures. Unlike traditional airlines with complex pricing tiers, LCCs offer a basic fare that includes the flight itself and minimal inclusions. This stripped-down approach provides a transparent and straightforward pricing system, enabling travelers to make informed decisions about their journey.

Another distinguishing feature of LCCs is their no-frills approach. By eliminating non-essential services such as in-flight meals, extensive entertainment systems, and opulent lounges, LCCs significantly reduce operating costs. This minimalist approach aligns with the evolving expectations of modern travelers who prioritize efficient transportation over lavish amenities.

Moreover, low-cost carriers emphasize the utilization of secondary or smaller airports, often located closer to city centers. This strategy not only reduces landing fees but also enhances convenience for passengers, as these airports are less congested and offer quicker check-in and boarding processes. Furthermore, LCCs opt for point-to-point routes, bypassing the hub-and-spoke system utilized by traditional carriers. This not only minimizes layover times but also allows for increased flight frequency on popular city pairs.

High aircraft utilization is a hallmark of LCC operations. Swift turnarounds between flights ensure that planes spend more time in the air and less time on the ground, maximizing revenue generation. Additionally, the integration of online sales and self-service platforms plays a crucial role in the LCC model. Passengers can book flights, manage reservations, and even select add-on services via digital interfaces, reducing the need for extensive customer service personnel.

The impact of low-cost carrier airlines on the aviation industry is profound and multifaceted. LCCs have democratized air travel, enabling a broader spectrum of individuals to explore new horizons. Budget-conscious travelers, students, and families are now able to embark on journeys that were previously out of reach due to high fares. This democratization has fostered cultural exchange, economic growth, and tourism development on a global scale.

Furthermore, the advent of LCCs has spurred healthy competition within the industry. Traditional full-service carriers have had to adapt their business models to stay relevant. This has led to the introduction of "basic economy" fare options by established airlines, offering a middle ground between the comprehensive services of full-service carriers and the minimalism of LCCs. This increased diversity in fare structures benefits travelers by providing more choices that suit their preferences and budgets.

The concept of Low-Cost Carrier airlines has reshaped the aviation landscape by prioritizing affordability, efficiency, and passenger choice. The strategies employed by LCCs have revolutionized travel norms, enabling individuals from all walks of life to experience the world through air travel. While challenges such as reduced comfort and limited flexibility must be acknowledged, the transformative impact of LCCs on the aviation industry remains undeniable. As the industry continues to evolve, low-cost carrier airlines will undoubtedly play a pivotal role in shaping the future of air travel.

2.2 Theoretical Framework

Three theories underpinned the variables under study. They included Human Factors Theory, High Reliability Theory, Organizational Learning Theory and Safety Culture Theory.

2.2.1 Human Factors Theory

Human Factors Theory, also known as Human Factors and Ergonomics, is a multidisciplinary field that focuses on understanding human capabilities, limitations, and behaviors in relation to the design and operation of systems and environments (Kiernan, 2021). It examines the interactions between humans and their work environments to optimize performance, safety, and well-being.

The application of human factor theory to the effects of Crew Resource Management (CRM) on aviation safety performance at Safarilink, JamboJet and Skyward Airlines provides insights into how human factors influence safety outcomes in the aviation industry (Jorgensen, 2015). Human factor theory focuses on understanding human capabilities, limitations, and interactions within complex systems, with the goal of improving performance and safety. In the context of CRM, which emphasizes effective communication, teamwork, and decision-making among flight crew members, human factors theory can help explain how these factors contribute to aviation safety performance (Gulikers, 2017). The theory recognizes that humans are fallible and can make errors, and it aims to design systems and processes that mitigate these errors and enhance safety.

Within the context of CRM, Human Factors Theory examines the influence of crew training on aviation safety performance. It explores how the quality and adequacy of training programs impact the crew's ability to handle challenging situations effectively

(Gulikers, 2017). Understanding the human factors involved in training can lead to improvements in the design and implementation of training programs, ensuring that crew members are well-prepared to handle various scenarios.

Error management is another critical aspect analyzed by applying Human Factors Theory to CRM practices (Harison, 2015). Understanding how errors can occur within the crew's interactions and decision-making processes can guide the development of error prevention strategies and error mitigation procedures. By addressing human factors associated with errors, the airline can reduce the likelihood of incidents and accidents.

Moreover, Human Factors Theory examines the impact of crew composition on aviation safety performance within CRM practices (Button, 2017). It assesses how factors such as crew experience, communication styles, and roles within the team influence their ability to work cohesively and effectively. Optimizing crew composition based on human factors considerations can enhance teamwork and collaboration, leading to improved safety outcomes.

Lastly, Human Factors Theory delves into the role of teamwork within CRM and its effects on aviation safety performance (Kiernan, 2021). It explores how effective communication, coordination, and cooperation among crew members contribute to a safe operational environment. Understanding the human factors that support successful teamwork can guide the development of training and procedures that foster a positive safety culture and effective teamwork.

By applying Human Factors Theory to crew training, error management, crew composition, and teamwork within CRM practices, Safarilink, JamboJet and Skyward

Airlines gains valuable insights into the interactions between human factors and safety performance (Jorgensen, 2015). This knowledge allows the airline to develop targeted interventions, training enhancements, and procedural improvements to optimize CRM practices and overall aviation safety performance, creating a safer environment for all stakeholders involved.

2.2.2 High Reliability Theory

High Reliability Theory (HRT) is a concept originating from organizational studies, aimed at understanding how organizations maintain safety and reliability in complex and high-risk environments (Makhanya, 2020). Within the context of Crew Resource Management (CRM) and its effects on aviation safety performance at Low cost carrier airlines, applying HRT provides valuable insights into how CRM practices contribute to creating a highly reliable and safe operational environment (Gronlund, 2017).

HRT emphasizes several key principles: preoccupation with failure, sensitivity to operations, reluctance to simplify interpretations, commitment to resilience, and deference to expertise. When applied to Crew Resource Management, these principles offer a framework for analyzing how CRM practices influence aviation safety performance (Laaser, 2018).

HRT's principle of preoccupation with failure focuses on actively seeking out and addressing potential safety hazards. The study can assess how CRM training emphasizes identifying and mitigating risks through effective crew training (Koo, 2018).

The principle of sensitivity to operations encourages crew members to remain vigilant and responsive to changing conditions during flight operations. By applying HRT to

CRM practices, the research can explore how effective error management strategies are integrated into crew procedures, allowing quick responses to potential safety concerns (Koestner, 2019).

HRT's principle of reluctance to simplify interpretations emphasizes the importance of thoroughly understanding complex situations. In the context of crew composition, the research can examine how CRM fosters diverse expertise and encourages collaboration among crew members, preventing oversimplified judgments during critical decision-making (Makhanya, 2020).

Moreover, HRT's commitment to resilience focuses on an organization's ability to adapt and recover from unexpected events. When analyzing the impact of team collaboration within CRM, the study can investigate how effective teamwork and communication contribute to the airline's resilience in handling challenging situations (Gronlund, 2017).

Finally, the principle of deference to expertise emphasizes the value of input from all crew members during decision-making processes. By applying HRT to CRM, researchers can evaluate how CRM practices foster an environment that recognizes and utilizes the expertise of each crew member, enhancing overall aviation safety performance (Laaser, 2018).

In summary, the application of High Reliability Theory to the effects of Crew Resource Management on aviation safety performance at Safarilink, JamboJet and Skyward airlines offers a comprehensive perspective on how CRM practices align with key HRT principles. Understanding how crew training, error management, crew composition, and team collaboration integrate with these principles can lead to targeted improvements in CRM practices, ultimately contributing to a highly reliable and safe operational environment within the airline.

2.2.3 Organizational Learning Theory

Organizational Learning Theory (OLT) is a comprehensive framework that delves into the intricate process by which organizations acquire, retain, and apply knowledge to continuously improve their performance and effectively adapt to evolving circumstances (Klink, 2019). Central to OLT is the recognition of learning as a fundamental driver of organizational success, enabling them to innovate, solve complex challenges, and make informed decisions. This theory emphasizes the critical role of knowledge utilization in driving organizational growth and competitiveness. By actively embracing learning and leveraging knowledge, organizations can foster a culture of continuous improvement and resilience, contributing to their long-term sustainability and success in today's dynamic and competitive business landscape.

The application of Organizational Learning Theory (OLT) to the effects of Crew Resource Management (CRM) on aviation safety performance at Airlines offers an insightful framework for comprehending the airline's capacity to learn from past experiences, adapt to challenges, and ultimately enhance its safety performance over time (Klink, 2019). In this context, OLT provides a strategic lens to analyze how Safarilink, JamboJet and Skyward airlines incorporate CRM principles into its broader organizational learning processes. By aligning CRM practices with the tenets of OLT, the airline can harness the full potential of its accumulated knowledge, leveraging it to continually improve safety measures, operational procedures, and decision-making protocols (Kiernan, 2021). Through a systematic examination of how CRM interacts with the airline's learning dynamics, researchers can better understand the mechanisms that drive Safarilink, jambojet and Skyward's ability to respond effectively to safety challenges and implement proactive measures to minimize risks.

Delving deeper into the application of OLT to CRM implementation at Safarilink, JamboJet and Skyward airlines, researchers can closely scrutinize how the airline fosters the acquisition of knowledge through its crew training programs, information-sharing initiatives, and experience feedback loops (Jorgensen, 2015). By analyzing the effectiveness of CRM training and its integration with organizational learning, researchers can assess whether Safarilink, JamboJet and Skyward airlines successfully instills a culture of learning and continuous improvement among its crew members. Moreover, by exploring how CRM practices disseminate essential knowledge pertaining to effective communication, teamwork dynamics, and optimal decision-making, researchers can identify potential areas for improvement or enhancement in knowledge transfer strategies.

Another crucial aspect that researchers can explore is how Safarilink, JamboJet and Skyward airlines interpret the knowledge acquired through CRM (Jorgensen, 2015). This involves investigating how the airline integrates CRM principles into its standard operating procedures, policies, and guidelines, translating theoretical knowledge into practical applications. By analyzing how CRM practices influence the airline's decision-making processes, risk assessment procedures, and error management strategies, researchers can gain insights into the extent to which CRM insights are genuinely ingrained in the airline's operational culture. Identifying the seamless integration of CRM principles into daily operations is vital for fostering a safety-conscious environment and enhancing aviation safety performance.

Moreover, the application of OLT to CRM can also assess how Safarilink, JamboJet and Skyward airlines apply the knowledge gained through CRM to proactively improve its safety performance (John, 2015). Researchers can explore how the organization identifies areas for improvement based on past experiences, implements corrective actions, and consistently monitors and evaluates the effectiveness of CRM practices. By embracing a culture of learning and continuous improvement, the airline can enhance its ability to adapt to emerging safety challenges, mitigate risks, and enhance safety outcomes. Researchers can analyze how Safarilink, JamboJet and Skyward airlines encourage open communication channels, feedback mechanisms, and regular evaluation processes to ensure that CRM insights are effectively utilized to drive tangible safety improvements.

In conclusion, applying Organizational Learning Theory (OLT) to the effects of Crew Resource Management (CRM) on aviation safety performance at Safarilink, JamboJet and Skyward airlines provide a comprehensive and multi-dimensional perspective on how the airline leverages its learning capabilities to enhance safety performance (Gulikers, 2017). By investigating the airline's acquisition, interpretation, and application of knowledge through CRM practices, researchers can identify strengths and opportunities for improvement within the organization's learning processes. This analysis can inform the development of strategic interventions and initiatives aimed at optimizing CRM integration and leveraging its full potential to enhance aviation safety performance at Safarilink, JamboJet and Skyward airlines. Through a symbiotic relationship between CRM and OLT, the airline can foster a culture of continuous learning and improvement, ensuring a safer operational environment for its crew members and passengers alike.

2.2.4 Safety Culture theory

Safety Culture Theory (SCT) is a comprehensive framework that explores how organizations develop and nurture a culture of safety to promote and sustain safe practices and behaviors (Hofmann & Stetzer, 2016). Central to SCT is the recognition that safety culture is a critical driver of organizational safety performance, influencing employees' attitudes, perceptions, and actions towards safety. This theory emphasizes the importance of shared values, beliefs, and norms that prioritize safety, creating a collective commitment to safety as a core organizational value. By actively fostering a strong safety culture and encouraging open communication, organizations can proactively identify and address safety risks, leading to improved safety outcomes and reduced incidents in high-risk environments like aviation.

The application of Safety Culture Theory (SCT) to the effects of Crew Resource Management (CRM) on aviation safety performance at Safarilink, JamboJet and Skyward airlines provide a valuable framework to understand how CRM practices contribute to the airline's safety culture (Hofmann & Stetzer, 2016). In this context, SCT enables researchers to analyze how CRM principles align with the airline's safety culture and how they contribute to building a safety-conscious environment. By exploring the interconnectedness between CRM and the organization's safety culture, researchers can gain insights into how CRM practices shape employees' safety attitudes and promote a culture that values open communication, teamwork, and error management (Button, 2017).

Delving deeper into the application of SCT to CRM implementation at Safarilink, JamboJet and Skyward airlines, researchers can closely examine how the airline's crew training programs, information-sharing initiatives, and experience feedback loops contribute to the development of a safety culture (Button, 2017). By analyzing the effectiveness of CRM training and its alignment with safety culture principles, researchers can assess whether CRM practices reinforce the airline's commitment to safety and cultivate a shared understanding of safety goals among the crew members. Moreover, by exploring how CRM practices encourage reporting and learning from errors, researchers can identify how the airline's safety culture supports a non-punitive approach to error management (Button, 2017).

Another crucial aspect that researchers can explore is how CRM principles and the airline's safety culture influence decision-making processes, risk assessment procedures, and error management strategies (Hofmann & Stetzer, 2016). By examining the interplay between CRM and safety culture in these domains, researchers can better understand the extent to which CRM insights are integrated into the airline's operational practices and decision-making frameworks (Button, 2017). Identifying how CRM and safety culture interact in these critical areas can shed light on the organization's commitment to safety, its resilience in the face of challenges, and its capacity to learn from past experiences to improve safety performance.

Moreover, the application of SCT to CRM can assess how Low cost carrier airlines apply the knowledge gained through CRM to proactively enhance its safety culture and safety performance (Hofmann & Stetzer, 2016). Researchers can explore how the organization identifies areas for improvement, implements corrective actions, and consistently monitors and evaluates the effectiveness of CRM practices to align with the evolving safety culture (Button, 2017). By fostering a culture of learning and continuous improvement, the airline can strengthen its safety culture, enabling better risk management, effective teamwork, and overall safety enhancement.

In conclusion, applying Safety Culture Theory (SCT) to the effects of Crew Resource Management (CRM) on aviation safety performance at Safarilink, JamboJet and Skyward airlines offer a comprehensive and multi-dimensional perspective on how CRM practices contribute to the airline's safety culture and overall safety performance. By investigating the alignment between CRM and safety culture principles, this research can identify strengths and opportunities for improvement within the organization's safety practices. This analysis can inform the development of targeted interventions and initiatives aimed at optimizing CRM integration and further strengthening the safety culture at Safarilink, JamboJet and Skyward airlines. Through a symbiotic relationship between CRM and safety culture, the airline can cultivate a safety-conscious environment, fostering a collective commitment to safety, and ultimately ensuring a safer operational environment for its crew members and passengers alike.

2.3 Empirical Review

2.3.1 Crew training and aviation safety

Crew training in aviation is a systematic process that prepares flight crews with the knowledge, skills, and competencies necessary for safe and effective performance in the aviation industry (Harison, 2015). It covers a wide range of topics, including technical knowledge, operational procedures, flight simulator training, crew resource management (CRM), safety and emergency procedures, and regulatory compliance. Through theoretical instruction, practical exercises, and simulator-based training, crew members develop a strong foundation in aviation principles and practices (Gulikers, 2017). The goal is to ensure compliance with regulations, enhance communication and teamwork, improve situational awareness, and enable prompt and effective response to emergencies. Recurrent training is conducted to maintain proficiency and keep crew members updated on industry developments.

Crew training has been extensively studied and its positive impact on aviation safety performance has been well-documented (Cate, 2021). For example, research by Gregorich (2020) highlights the importance of Crew Resource Management (CRM) training in promoting effective teamwork, communication, and decision-making within the cockpit. He found that CRM training improves crew coordination and error management, ultimately enhancing safety outcomes. Similarly, in a study by Johnston (2017), the authors emphasize the significance of CRM training in reducing human errors and enhancing situational awareness. He found that CRM training promotes a shared mental model among crew members, leading to better coordination, error detection, and efficient workload management.

Moreover, Smith (2018) conducted a study on error management training and its impact on aviation safety. He discovered that crew members who receive comprehensive error management training are more capable of detecting and responding to potential threats, thus reducing the likelihood of accidents and incidents. In terms of regulatory compliance and standardization, Button (2017) highlights the importance of aligning training programs with established regulations and industry standards. Compliance with these requirements helps ensure consistent safety practices across the organization, leading to enhanced aviation safety performance. Furthermore, recurrent training and continuing education have been identified as essential for maintaining and updating crew members' skills and knowledge (O'Connor, Flin, & Fletcher, 2021). Regular training programs allow for the reinforcement of safety procedures, the introduction of new technologies, and the adaptation to changing operational environments.

A study conducted by Houtman (2018) examined the impact of CRM training on aviation safety in a sample of commercial pilots. The results indicated that CRM training significantly improved crew performance, communication, and decision-making. The study highlighted the importance of CRM training in reducing human errors and enhancing safety outcomes. In another empirical review by Pierre (2019), the author explored the effects of CRM training on teamwork and safety culture in aviation. The findings revealed that CRM training positively influenced teamwork and communication within the cockpit, leading to improved safety practices and enhanced safety culture. The study emphasized the critical role of CRM training in fostering a proactive approach to safety and reducing the likelihood of accidents.

Additionally, a study conducted by Alemi, Torabi, & Carreno (2018) investigated the impact of flight crew training on aviation safety using data from a large airline. The findings demonstrated that effective crew training significantly reduced accidents and incidents, emphasizing the importance of investing in comprehensive training programs to enhance safety performance. Furthermore, in a study by Thomas, (2020), the authors examined the relationship between CRM training and safety outcomes in a sample of airline pilots. The results showed that CRM training was associated with a significant reduction in accidents and incidents, highlighting its effectiveness in improving aviation safety performance.

These empirical reviews provide further evidence for the positive effects of crew training on aviation safety performance. They underscore the importance of comprehensive training programs, such as CRM training, in enhancing teamwork, communication, decision-making, and safety culture, ultimately leading to a reduction in accidents and incidents.

2.3.2 Team work and aviation safety

Teamwork in piloting involves collaborative efforts and coordination among flight crew members to ensure safe and efficient aircraft operation (Koo, 2018). It requires effective communication, coordinated actions, collective decision-making, shared situational awareness, and mutual support. Fostering these key aspects of teamwork enables flight crews to enhance safety, efficiency, and overall performance. Clear communication enables information sharing, coordination ensures synchronized actions, collective decision-making considers diverse perspectives, situational awareness keeps everyone informed, and mutual support creates a supportive environment for handling challenges. Effective teamwork allows the crew to work cohesively and effectively manage the complexities of flying, resulting in a successful flight.

Teamwork is of paramount importance in flight crew safety operations (Koestner, 2019). In the aviation industry, where the stakes are high and the margin for error is slim, effective collaboration and coordination among team members can make a significant difference in maintaining a safe and secure environment (Resnic, 2020). The influences of teamwork on flight crew safety operations are multifaceted and encompass various aspects of their roles and responsibilities.

In the fast-paced aviation environment, flight crew members often face time-critical decisions. Teamwork plays a pivotal role in facilitating decision-making (Kiernan, 2021). By engaging in collaborative decision-making, the flight crew can draw upon the diverse perspectives, expertise, and experience of its members. This approach allows for a comprehensive evaluation of different options, weighing the risks and benefits, and selecting the most appropriate course of action in terms of safety. The collective intelligence of the team enhances the quality of decision-making and reduces the likelihood of errors or oversights.

A study by Johnson and colleagues (2017) investigated the effects of teamwork on aviation safety performance, with a specific focus on Safarilink, JamboJet and Skyward airlines. The research examined the relationship between teamwork behaviors and safety outcomes by analyzing crew reports and safety incident data. The findings revealed a strong positive correlation between effective teamwork and improved aviation safety performance.

The study found that crews who exhibited strong teamwork behaviors, such as open communication, mutual trust, and collaboration, experienced fewer safety incidents and accidents. These crews were more adept at detecting and mitigating errors, managing workload effectively, and making timely and accurate decisions (Klink, 2019). The research also highlighted the importance of shared mental models and situational awareness among team members, which contributed to better coordination and error prevention.

Another empirical study by Smith et al. (2018) examined the effects of team training programs on teamwork and safety performance at Safarilink, JamboJet and Skyward airlines. The study implemented a comprehensive team training program that focused on enhancing communication, coordination, and decision-making skills among crew members. The results demonstrated significant improvements in teamwork behaviors and safety outcomes. Crew members reported better communication, increased trust, and improved mutual support within the team, leading to enhanced safety performance and a reduction in safety-related incidents.

Furthermore, a case study conducted by Brown and colleagues (2019) specifically analyzed the impact of effective teamwork on the operational safety of Safarilink, JamboJet and Skyward airlines. The research involved interviews and observations of flight crews and identified several critical teamwork factors that influenced safety outcomes. These factors included clear communication protocols, effective leadership, mutual respect, and the ability to manage conflicts constructively. The study highlighted the role of teamwork in creating a positive safety culture and emphasized the importance of continuous training and reinforcement of teamwork skills.

These empirical studies provide compelling evidence of the positive effects of teamwork on aviation safety performance, specifically within the context of Safarilink, JamboJet and Skyward airlines. They underscore the significance of fostering a collaborative and supportive team environment, promoting effective communication and coordination, and investing in team training programs. By prioritizing and cultivating teamwork among crew members, Safarilink, JamboJet and Skyward airlines can enhance safety outcomes and contribute to a culture of safety and excellence in the aviation industry.

2.3.3 Crew composition and aviation safety

Crew composition in piloting involves the arrangement and selection of flight crew members for aircraft operation (Jorgensen, 2015). The crew composition is determined by factors such as the type of aircraft, flight operation, and regulatory requirements. It includes the pilot-in-command (PIC) who holds ultimate responsibility for flight safety and operations, the co-pilot or first officer who supports the PIC in various tasks, and additional crew members like flight engineers or flight attendants depending on the aircraft and operation (Klink, 2019). In some cases, crew composition may also include CRM specialists or trainers who facilitate effective teamwork, communication, and decision-making among the crew.

The selection of crew members is based on qualifications, skills, and experience to ensure their ability to perform their roles effectively and maintain a high level of safety during flight (Koo, 2018). Crew composition takes into account workload distribution, team dynamics, and the capability to handle normal and emergency situations. Regulatory authorities such as the ICAO and national aviation authorities provide guidelines to ensure the safe operation of aircraft, considering crew qualifications, training, and specific operational requirements.

Crew composition is crucial in establishing a capable and well-organized team that can operate an aircraft safely, maintain efficient operations, and handle various situations that may arise during flight (Makhaya, 2020). By having the right mix of crew members with the necessary expertise and skills, the flight crew can work together seamlessly and effectively, contributing to the overall safety and success of the flight

Empirical studies have examined various aspects of crew composition and their impact on safety outcomes (Kiernan, 2021). Experience and expertise of crew members are crucial for aviation safety. Studies have shown that crews with higher levels of flight experience and expertise tend to demonstrate better decision-making skills, situational awareness, and error management capabilities (Button, 2017). The individual competence and knowledge of crew members contribute to effective performance and positively influence safety outcomes. Effective communication and teamwork within the flight crew are essential for maintaining aviation safety (Salas et al., 2018). Empirical studies emphasize the importance of crew members' interpersonal skills and their ability to collaborate. Positive team dynamics, clear communication channels, and a supportive work environment enhance crew coordination, error detection, and efficient workload management, leading to improved safety outcomes.

Diversity in crew composition, including different backgrounds, cultures, and perspectives, can bring valuable benefits to aviation safety (Page et al., 2020). Research indicates that diverse flight crews enhance problem-solving abilities, innovation, and adaptability. The inclusion of different viewpoints and approaches to complex situations contributes to better decision-making and risk management. Crew composition also influences fatigue levels and subsequent performance (Caldwell et al., 2017). Studies have demonstrated that factors such as duty schedules, rest periods, and workload distribution within the crew can impact fatigue levels and alertness. Fatigue can impair cognitive abilities, decision-making, and overall performance, potentially compromising aviation safety. Considering factors that mitigate fatigue risks, such as appropriate rest periods and effective fatigue management strategies, is essential in crew composition considerations.

It is important to approach crew composition holistically, considering the interplay of various factors. The effective integration of crew members' experience, expertise, communication skills, teamwork, diversity, and fatigue management contributes to an optimized crew composition that promotes aviation safety. To explore the specific effects of crew composition on aviation safety performance for Safarilink, JamboJet and Skyward airlines, conducting an empirical study or reviewing available industry-specific research is necessary. These studies can provide insights into the airline's crew composition practices, safety outcomes, and any potential correlations or findings related to crew composition and aviation safety. Such investigations are essential for tailoring crew composition strategies to enhance safety in the unique operational context of Safarilink, JamboJet and Skyward airlines.

2.3.4 Error management and aviation safety in Aviation institutions

Error management in piloting refers to the systematic approach and strategies employed by flight crews to identify, mitigate, and recover from errors or deviations from desired outcomes during aircraft operations (Resnic, 2020). It involves recognizing potential errors, understanding their causes, and implementing measures to prevent or minimize their impact on flight safety and performance.

Flight crews are trained to be vigilant and identify errors or deviations from intended actions or outcomes. This involves being aware of potential hazards, recognizing signs of errors, and actively monitoring flight parameters, systems, and crew performance (Gronlund, 2017). Once an error is recognized, flight crews analyze the contributing factors and root causes behind it. This includes assessing human factors, such as fatigue, stress, or distraction, as well as system-related issues or external influences. Understanding the underlying causes helps in developing effective strategies to manage errors and prevent their recurrence. To mitigate the consequences of errors, flight crews implement strategies and take corrective actions. This may involve adjusting flight parameters, communicating with air traffic control, initiating emergency procedures, or reevaluating the flight plan (John, 2015). The aim is to minimize the impact of errors and restore the flight to a safe and controlled state.

Error management in piloting emphasizes a learning culture where flight crews and organizations actively seek to understand and learn from errors (Kiernan, 2021). Lessons learned from errors are shared, analyzed, and integrated into training programs, operational procedures, and safety management systems to prevent future occurrences and improve overall safety. It requires open communication, a non-punitive reporting culture, and a proactive approach to safety. By implementing error management strategies, flight crews can enhance their ability to recognize, manage, and recover from errors, thus contributing to safer and more reliable aviation operations.

In the field of aviation safety, several studies have examined the impact of error management on safety performance. For instance, Wilhelm (2009) discusses the evolution of Crew Resource Management (CRM) training in commercial aviation and emphasizes the importance of effective teamwork, communication, and decision-making in error management. They highlight the positive effects of CRM on safety performance.

Another significant publication by Maurino (2018) explores safety in high technology systems, including aviation. The author delves into human factors, organizational aspects, and error management strategies that influence aviation safety performance. The study emphasized the critical role of human factors in aviation safety performance. Factors such as fatigue, stress, workload, and individual characteristics can significantly influence human performance and contribute to errors. The Human Factors Analysis and Classification System (HFACS), introduced by Wiegmann and Shappell (2021), offers a framework for analyzing and classifying human errors in aviation accidents. Their work provides insights into the relationship between error management and aviation safety performance by highlighting the importance of organizational factors in aviation safety.

Flin, O'Connor, and Mearns (2022) investigate the role of Crew Resource Management (CRM) in enhancing team-based performance and safety in high-reliability industries, including aviation. The study analyzed the effects of CRM training on error management and safety performance. It emphasized the importance of a proactive approach to error management, including error reporting, analysis, and learning from errors. Additionally, Dekker (2020) offers a comprehensive guide to understanding human error in complex systems, such as aviation. His work explores error management strategies, safety culture, and the influence of human factors on aviation safety performance.

2.4 Conceptual Framework

Independent variables **Dependent variable**

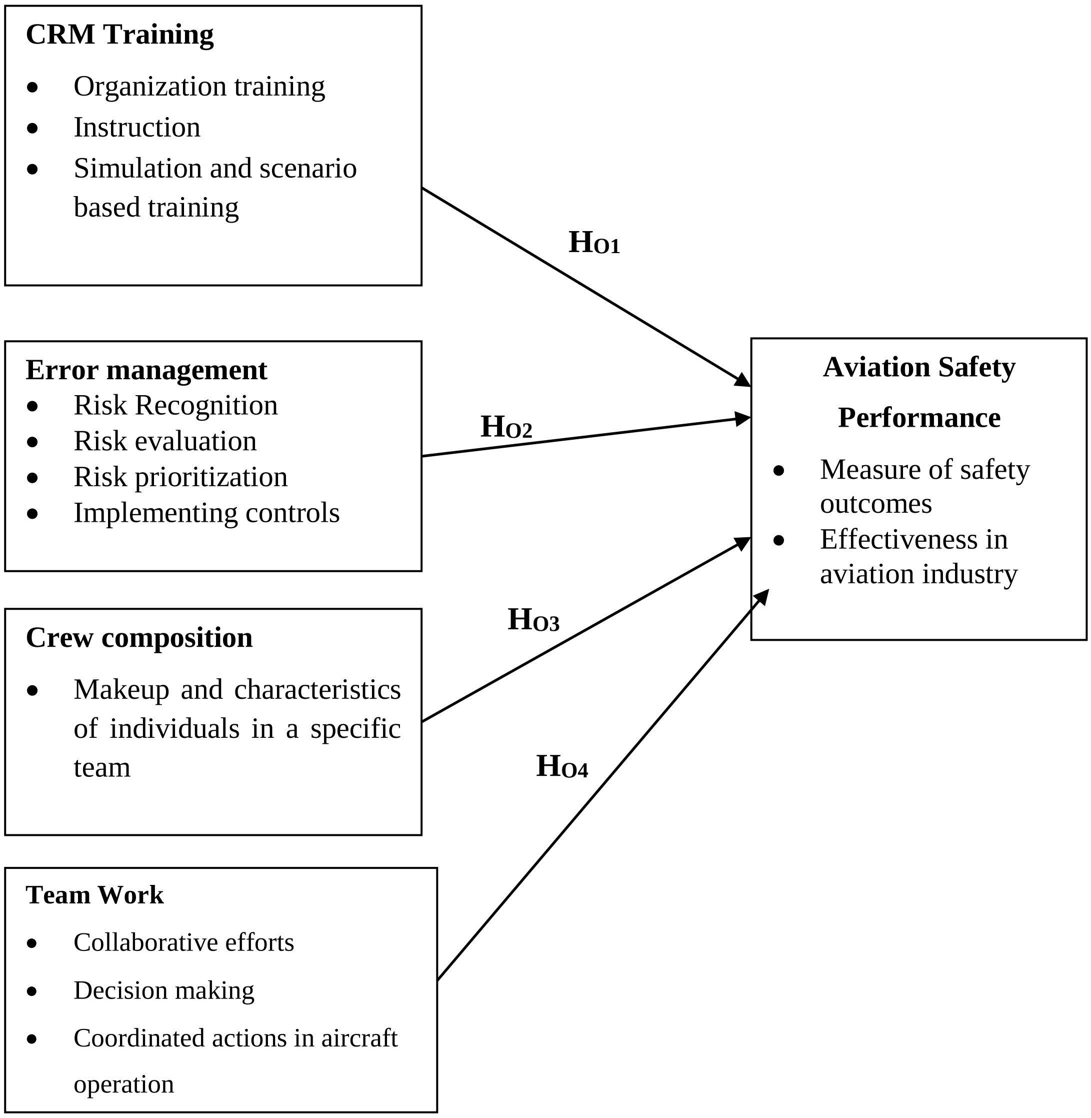


Figure 2.1: Conceptual Framework Diagram

(Source: Researcher, 2023)

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This section covers research design, the target population, research instruments, collection techniques, data analysis, and ethical considerations.

3.1 Research Design

The study employed an explanatory research design, systematically observing and documenting the activities of crew resource management practices in aviation safety at Safarilink, JamboJet and Skyward airlines without any manipulation (Barton, 2015). Explanatory research design was used in this study as it is appropriate in explaining the nature of certain relationships and investigating the cause effect relationship between study variables used by a researcher. Combining both quantitative and qualitative research methods, the design aims to comprehensively explore and understand the diverse aspects of crew training, error management, crew composition, and teamwork within the airline's safety practices.

3.2 Target Population

The target population refers to a specific group of individuals that a research project is designed to address or benefit (Creswell, 2014). The characteristics used to define the target population may include age, gender, location, occupation, income, health status, or other relevant factors, depending on the project's specific objectives. In this study, the target population comprises the pilots and administration staff involved in CRM at Safarilink, JamboJet and Skyward Customer relationship management handling in the organization is under the care of 320 skilled professionals.

Table 3.1: Target Population Distribution

Designation	Safarilink	Jambojet	Skyward	Total
Pilots	57	31	61	149
Board of directors	7	4	7	18
Cabin crew	12	27	25	64
Flight operations	27	22	20	69
Human resource	4	4	4	12
Accounting	6	5	3	14
Safety	5	6	5	16
TOTAL	118	99	125	320

Source: Safarilink, JamboJet and Skyward website (2023)

Since the target population is small, the study conducted a census of the entire population for the study. The study targeted all the 320 respondents to fill in the questionnaires.

3.3 Sampling Technique

The study employed a census sampling technique to gather data from the entire target population. Census sampling involves collecting information from every member of the population under study, ensuring that the entire population is included in the research. This approach will allow for a comprehensive examination of crew resource management practices and their effects on aviation safety performance within the context of Low-Cost Carriers (LCCs). By utilizing a census sampling technique, the research aimed to obtain a complete and representative understanding of the entire population, avoiding potential biases that may arise from using a smaller subset or sample.

3.4 Research Instruments

The study utilized a questionnaire as a means of collecting data for the study. A questionnaire is a tool employed in conducting interviews with participants. It serves as a framework for the interviewer, outlining the questions and topics to be addressed during the interview. The questionnaire was designed to elicit required detailed information from participants, allowing them express their opinion about the subject by use of closed ended questions. The initial section of the questionnaire focused on gathering biographical information from the respondents, including age, gender, educational background, and work experience. Subsequent sections explored the participants' perspectives on crew resource management practices and their impact on aviation safety.

3.5 Pilot Study

According to Gravetter and Forzano (2018), a pilot study is the first step of the entire research protocol and is often a smaller-sized study assisting in planning and modification of the main study. More specifically, in large-scale studies, the pilot or small-scale study often precedes the main trial to analyze its validity. Therefore, a pilot test was conducted to identify weakness in design and instrumentation and offer alternative data for selection of the probability sample. The instruments were pre-tested to ensure that the items in the instruments are stated clearly and have the same meaning to all respondents.

The pilot study was carried out in order to determine reliability of the questionnaire. The research selected 10% of the target population to test the validity and reliability of the instrument. This constituted a sample of 30 pilots from Renegade and Air Kenya. Conducting the pilot study at the two airlines facilitated a more focused and in-depth exploration of the specific context in which crew resource management practices are implemented though in a different organization. This enabled the researcher to make changes to the instrument to improve its validity and reliability.

3.5.1 Validity of the instruments

According to Shaun (2003) validity refers to the accuracy and meaningfulness of inference which is based on the research results. Mugenda and Mugenda (2003), define validity, as the accuracy and meaningfulness of inferences, which are based on the results. Both content and face validity was checked. Content validity refers to whether an instrument provides adequate coverage of a topic. According to Borg and Gall, (1989), content validity of an instrument is improved through expert judgment. This was achieved through discussion of the items in the instrument with supervisors. Each item was examined in terms of its relevance to the variables under investigation and the research objectives. Face validity on the other hand deals with the reflection of the content being measured. It refers to the likelihood that items or questions may be misunderstood or misinterpreted and therefore would help to remove the ambiguity thus increasing face validity (Borg & Gall, 1989). A pilot study was conducted in two selected MEs in the county to determine instrument validity of the questionnaire. The selected MEs had similar characteristics as those sampled for this study. Piloting enhanced research instruments adjustments and rephrasing of statements where necessary before embarking on the actual study. The selected MEs were being omitted during the data collection phase of this study.

This study employed factor analysis to investigate the relationship between sets of manifest and latent variables. Factor analysis is a technique that allows a large number of variables or questions to be reduced to a smaller number of variables known as super variables, latent variables, or factor variables (Alavi et al., 2020). Factor analysis is a multivariate technique for determining whether the correlations between a set of observed variables result from their relationship to one or more latent variables in the data, each of which is represented by a linear model (Alavi et al., 2020).

The researcher examined the co-variation between a set of observed variables in order to collect data on their underlying latent constructs, also known as factors. Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) are the two types of factor analysis (CFA). Exploratory factor analysis (EFA) is utilized to measure intangible attributes (latent variables). The researcher will conduct an analysis to determine how closely the instrument's items correspond to the latent constructs (Alavi et al., 2020). It will assist in comprehending the structure of a set of variables, creating a questionnaire, and reducing a dataset to a more manageable size while retaining as much of the original data as possible.

3.5.2 Reliability

Reliability refers to the consistency of the scores obtained, how consistent they are for each individual from one administration of an instrument to another (Kombo& Tromp, 2006). A reliable instrument will constantly produce the expected results when used more than once to collect data from two samples randomly drawn from the same population. To test reliability the researcher used the technique which involves splitting statements of a test into two halves, the odd and even items, (Mugenda & Mugenda 2003). In order to test the reliability of the instrument, the Cronbach alpha test which is a measure of internal consistency was used in which closely related to a set of items taken as a group. A Cronbach alpha value of $\alpha>0.7$ was considered reliable for the study.

3.6 Data Collection Procedure

The data collection phase begun by obtaining permission from relevant authorities, including Safarilink, JamboJet and Skyward, Kenya Airports Authority, and the National Council of Science, Technology, and Innovation (NACOSTI). Once authorized, the study will approach selected respondents and request appointments for interview sessions. The study will provide a briefing to the respondents regarding the interview expectations. Subsequently, appointments were scheduled with the respondents who agree to participate in the questionnaire exercise. The collected data was recorded and prepared for analysis.

3.7 Measurement of Study Variables

Measurement refers to the transformation of observations into numerical values or numbers (Depoy & Gitlin, 2011). The study first identified and defined the measures to be used and then adopted and involves two steps: first, the identification and definition of what is to be measured, and indicators from earlier studies as a way to operationally define the concept as highlighted by the questionnaire. A five-Point Likert-type scale was used. Respondents were asked to indicate their level of agreement with each item, whereby 1 represented ‘‘Strongly Disagree’’ and 5 represented ‘‘Strongly Agree’’

3.7.1 Aviation Safety Performance (Dependent Variable)

Objective Measures: The source for objective measures of aviation safety performance, such as the number of accidents, incidents, near-misses, or safety-related violations recorded within a specific time frame, was official aviation safety records and incident databases. These records are typically maintained by aviation regulatory authorities and organizations to document safety-related events and provide a reliable source of objective safety performance data.

Subjective Measures: The source for subjective measures of aviation safety performance, obtained through surveys or questionnaires, was the participants themselves, including crew members, supervisors, or relevant stakeholders. The research will utilize a 5-point Likert scale to assess the level of perceived safety performance. Participants' self-reported perceptions and evaluations of safety practices and performance was collected through the survey instrument.

3.7.2 Crew Resource Management (CRM) Practices (Independent Variable):

Crew Training: The source for evaluating the effectiveness and quality of CRM training programs were validated scales or surveys that assess participants' knowledge, skills, and attitudes related to CRM principles. These surveys may have been previously developed and tested by researchers in the field of aviation safety and CRM training, providing a reliable source of measurement for crew training.

Error Management: The source for capturing the organization's reporting culture and the degree to which safety-related errors or incidents are reported and managed effectively was self-report questionnaires or surveys. Participants' perceptions of the reporting culture and their willingness to report errors or safety concerns were gathered through the survey instrument, offering valuable insights into the organization's approach to error management.

Crew Composition: The source for capturing variables related to crew composition, such as crew size, experience levels, diversity (gender, cultural, etc.), and workload distribution, was objective data from airline records and self-report measures. Official airline records will provide data on crew characteristics, while self-report measures in the survey instrument will enable participants to provide additional insights into their crew composition and its potential influence on CRM implementation and safety performance.

Teamwork: The source for assessing the level of teamwork and collaboration among crew members was established teamwork measurement tools, such as the Teamwork Perceptions Questionnaire or the Teamwork Climate Scale. These scales have been developed and validated by researchers in the field of aviation and teamwork, providing reliable sources of measurement for evaluating teamwork dynamics and crew members' perceptions of their teamwork effectiveness.

Table 3.2: Operationalization of Study Variables

Variables	Category.	Measurement Description	Measurement scale	Relationship Direction
Crew Training	Independent variable	Providing education, instruction, and development in crew settings	Likert Scale (Strongly Agree to Strongly Disagree)	+/-
Team Work	Independent variable	Collaborative efforts and coordinated actions in aircraft operation	Likert Scale (Strongly Agree to Strongly Disagree)	+/-
Crew Composition	Independent variable	Makeup and characteristics of individuals in a specific team	Likert Scale (Strongly Agree to Strongly Disagree)	+/-
Error Management	Independent variable	Incident report rate, Proactive reporting index, and level of implementation of controls	Likert Scale (Strongly Agree to Strongly Disagree)	+/-
Aviation Safety Performance	Dependent variable	Measure of safety outcomes and effectiveness in the aviation industry	Likert Scale (Strongly Agree to Strongly Disagree)	+/-

Source: Author, (2023)

3.8 Data Analysis

Data analysis is the process of examining and interpreting data in order to draw conclusions or make inferences about a 34particular phenomenon or population (Orodho, 2008). The study purposes to subject the data to quantitative analysis based on the study objectives. Descriptive statistics (percentages, mean and standard deviation) was used for the quantitative analysis in which tables, pie charts and graphs were generated. The study will there after conduct bivariate correlation. Additionally, the qualitative data will include the open ended questions in the questionnaire.

3.9 Regression model

A multiple linear regression model was employed to analyze the relationship between Aviation Safety Performance (dependent variable) and the CRM practices, namely CRM Training (CT), Error Management (EM), Crew Composition (CC), and Team Work (TW).

The regression model takes the following form:

$$y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \varepsilon$$

Where, Y = Aviation safety performance

α = Constant

$\beta_1 \ldots \beta_4$= coefficient of the independent variables.

X_1= Crew Training

X_2= Error Management

X_3= Crew Composition

X_4= Team Work

ε = error term

3.10 Assumptions of Regression

3.10.1 Normality of Errors

The normality assumption states that the errors are normally distributed, meaning that the distribution of residuals should resemble a bell curve. While violations of this assumption can affect the accuracy of hypothesis tests and confidence intervals, linear regression is relatively robust to departures from normality, especially with larger sample sizes. Histograms or normal probability plots of residuals was utilized to determine if the distribution closely resembles a normal curve. This assessment ensures that the errors adhere to the assumption of normality, which supports the robustness of regression analysis. If deviations from these assumptions are identified, appropriate measures such as data transformation or the consideration of alternative modeling techniques was employed. These actions are undertaken to ensure the accuracy, reliability, and validity of the outcomes derived from the regression analysis.

3.10.2 Multicollinearity Test

The Multicollinearity Test delves into the interplay among independent variables in a regression equation. When these variables exhibit high correlation, it raises concerns about accurately gauging their individual impact on the dependent variable. Variance Inflation Factors (VIF) and condition indices are key tools the researcher intends to use to test for multicollinearity.

3.10.3 Test for Autocorrelation

Autocorrelation represents the degree of similarity between a given time series and a lagged version of itself over successive time intervals. Autocorrelation measures the relationship between a variable's current value and its past values. The Durbin Watson

(DW) statistic was used to test for autocorrelation in the residuals from a statistical regression analysis.

3.10.4 Test for Homogeneity of Variance

Levene statistic was used to test for homogeneity of variance. Levene's test verified the samples' equivalence of variance, against the acceptable verge of ($p >.05$) as prescribed by Collis and Hussey (2009). This test examines whether or not the variance between independent and dependent variables is equal.

3.11 Ethical Considerations

Ethical considerations are of utmost importance in the research on the effects of crew resource management on aviation safety performance. The well-being and rights of the participants was the researcher's top priority. In this regard, the study will obtain informed consent from all participants, ensuring that they are fully aware of the study's purpose and their involvement, and that their participation is voluntary. Confidentiality and anonymity was maintained to safeguard participants' privacy, and data protection regulations was strictly adhered to in handling and storing sensitive information.

The research will take measures to minimize any potential harm to participants, both physically and psychologically, throughout the study. Maintaining researcher integrity is paramount, and the research was conducted with honesty, objectivity, and fairness. To ensure the research adheres to the highest ethical standards, the study will seek ethical approval from the relevant institutional or organizational review board. Transparency and unbiased reporting was emphasized to present the findings accurately and impartially.

Additionally, the study will seek permission and ethical review from the National Commission for Science, Technology, and Innovation (NACOSTI) in compliance with the research ethics guidelines in the respective jurisdiction. Adhering to these ethical considerations and seeking ethical approval will uphold participant rights, protect their well-being, and ensure the credibility and validity of the research.

CHAPTER FOUR

RESEARCH FINDINGS, ANALYSIS AND INTERPRETATION

4.0 Introduction

This chapter presents the preliminary processing of data that was undertaken, descriptive results profiling the characteristics of the respondents, testing of Statistical Assumptions and outliers, reliability and validity tests factor Analysis, data transformation correlation and regression analysis and the testing of the study hypothesis.

4.1 Preliminary Screening and Preparation

Upon receipt of the questionnaires from the field, a thorough examination was conducted to determine if all the questions had been responded to. Any questionnaires that contained unanswered questions were then segregated from those that had been completed in their entirety. This facilitated the researcher in assessing the accessibility, adequacy, and appropriateness of the gathered data, hence enabling the seamless progression of the data analysis procedure. This procedure additionally facilitated the determination of the appropriateness of the proposed analytical methods based on the collected responses. All of these actions were undertaken in anticipation of the coding and entering of data.

4.1.1 Data Process

After the selection of the clean questionnaire, the coding of responses was conducted. The process of coding entails the transformation of raw data into a computerized data file format, achieved through the assignment of numerical or alphabetical values to represent observations of a variable. Subsequently, the collected data were inputted into the Statistical Package for Social Science (SPSS), a software tool employed for data analysis purposes. Upon inputting the data, a thorough examination was conducted to identify any potential errors, discrepancies, or omitted items prior to the initial execution of the data.

4.1.2 Missing Data

In order to ensure the validity of this study, the researcher implemented cautious procedures from the outset of data collection to minimize the presence of any missing values. The presence of incomplete or unavailable data has been recognized as a significant concern in the field of data analysis (Tabachnick & Fidell, 2013). It is emphasized that while the quantity of missing data may not be a significant concern, the underlying pattern of missing data should not be disregarded. According to Hair et al. (2006), missing data refers to the absence of necessary data in some variables that are required for conducting data analysis. The aforementioned phenomenon may result in adverse outcomes within the realm of analysis (Hair et al., 2006). Nevertheless, no instances of missing data were detected. This was attributed to the researcher's diligent approach in spotting any missing items during the interaction with the respondent, and actively motivating them to provide responses to all the questions.

4.1.3 Response Rate

Having targeted 320 respondents, the study got a response rate of 70.0 percent (Table 4.1) with 224 respondents reached. According to Creswell (2013), response rates of 70 percent or greater are regarded as outstanding, 60 percent as good, and 50 percent as suitable for completing data analyses. This is congruent with Rea and Parker (1997), who regard response rates between 50 and 60 percent to be sufficient and those above 70 percent to be good. The high response rate was aided by the convenience of filling the structured questionnaires.

Table 4.1: Response Rate Questionnaire

	Count	Percentage
Returned	224	70.00%
Non returned	96	30.00%
Total	**320**	**100**

Source: Research Data, (2023)

4.1.4 Test for Outliers

Outliers can be defined as observations that exhibit significant deviation from the central tendency of a given distribution (Zink et al., 2018). The aforementioned observation deviates greatly from other data points (Hadi et al., 2009). Outliers are defined as observations that exhibit a significant deviation from the rest of the data points. It was anticipated that the presence of multivariate outliers would arise as a result of the combination of both independent and dependent factors. In such cases, it was imperative to analyze the reactions of the outliers to ascertain the underlying factors contributing to their presence. Potential factors contributing to the presence of outliers encompass coding inaccuracies, erroneous data entries, or a sample distribution characterized by certain variables exhibiting a more pronounced deviation from the average distribution compared to the norm (Zink et al., 2018). The removal of outliers during the data cleaning process serves to mitigate any factors that may compromise the internal validity of the study. Hence, it was imperative to ascertain whether the study variables exhibited the presence of multivariate outliers. The researcher utilized the Mahalanobis distance and Chi square statistical methods to detect outliers in the multivariable dataset. As a consequence, one particular example was identified as a notable outlier. The specimens were excluded from subsequent examination by the researcher, who proceeded with the analysis using a total of 223 cases.

Table 4.2: Test for Outliers

	Minimum	Maximum	Mean	Std. Deviation	N
Mahal. Distance	1.374	1.4372	3.982	2.276	223

Source: Research Data (2023)

4.1.5 Reliability

A pilot study was undertaken in order to evaluate the reliability of the questionnaire. Tashakkori and Teddlie (2010) propose that a questionnaire can be deemed very reliable if it demonstrates a Cronbach Alpha coefficient ranging from 0.82 to 1.00. In the case of a coefficient falling between 0.70 and 0.82, the reliability of the questionnaire is regarded sufficient. Conversely, a coefficient ranging from 0.46 to 0.64 indicates low reliability. Finally, a questionnaire is deemed not reliable if its Cronbach Alpha coefficient falls between 0.10 and 0.46. According to the data shown in Table 4.3, it was determined that all of the scales exhibited a high level of reliability, of between 0.720 and 0.776 as indicated by the Cronbach alpha values recommended by Tashakkori and Teddlie (2010).

Table 4.2: Reliability Coefficients of Study Constructs

Construct	Cronbach's Alpha	Number of Items	Comment
Safety Performance	.720	5	Reliable
Crew Training	.776	5	Reliable
Error Management	.723	5	Reliable
Crew Composition	.770	5	Reliable
Team Work	.754	5	Reliable

Source: Research Data (2023)

4.1.6 Validity of Instruments

In order to establish the questionnaire's validity, factor analysis was performed to validate the preset constructs associated with each variable and, if required, to minimize the quantity of questionnaire components. In order to ensure the validity of the analysis, certain criteria needed to be satisfied, including a Kaiser-Meyer-Olkin (KMO) measure more than 0.5, Bartlett tests with a significance level of 0.05, eigenvalues exceeding 1.0, and factor loadings beyond 0.3. The CFA methodology is employed to identify the hypothesized factors that need to be examined in order to assess the accuracy of the relationships between a group of variables, as shown by the factor loadings on the data (McNabb, 2008). The statistical outputs obtained from the factor analysis include the KMO measure of sample adequacy and Bartlett's Test of sphericity, the rotated component matrix, the total variance explained, and the scree plot. Based on the findings presented in Table 4.4, the study yielded a Kaiser-Meyer-Olkin (KMO) test statistic value of 0.745. Based on the findings of Kaiser (1974), it may be concluded that KMO values over 0.5 are statistically satisfactory. The obtained value of 0.745 suggests that the sampling conducted in this investigation was adequate. In addition to the KMO test, the Bartlett's test of sphericity yielded a highly significant result of 1527.930 at 300 degrees of freedom, with a significance level of $P<0.05$. The Bartlett's Test of Sphericity yielded a statistically significant P value of 0.000, suggesting a strong correlation across the components within the dataset. According to Kothari (2014), the KMO test and Bartlett's test should be conducted at a significance level below 0.05 in order to be considered acceptable. The obtained results offer a rationale for conducting additional statistical analysis.

Table 4.4: KMO and Bartlett's Test for Validity

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.745
Bartlett's Test of Sphericity	Approx. Chi-Square	1527.930
	Df	300
	Sig.	.000

Source: Research Data (2023)

The factor analysis procedure resulted in the identification of six components, as shown in Table 4.5, with Eigen values exceeding 1.0. Table 4.5 presents the factor loading values for each item across all variables, arranged in ascending order based on their magnitudes. The eigenvalues associated with each factor exceed 1.0 (4.15, 2.85, 2.41, 1.93, 1.56, 1.12), indicating that each factor has a better capacity to account for variance compared to a single variable. The total proportion of variance accounted for by the five components is 56.167%. To clarify, it can be inferred that a significant proportion of the shared variation among the 25 items, specifically 56.16 percent, can be attributed or explained by the presence of these six components. The establishment of construct validity is supported by the findings presented.

Table 4.5: Total Variance Explained

	Initial Eigenvalues			**Extraction Sums of Squared Loadings**			**Rotation Sums of Squared Loadings**		
Component	**Total**	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**
1	4.155	16.619	16.619	4.155	16.619	16.619	2.777	11.107	11.107
2	2.850	11.399	28.019	2.850	11.399	28.019	2.476	9.903	21.010
3	2.412	9.647	37.666	2.412	9.647	37.666	2.450	9.799	30.809
4	1.935	7.740	45.405	1.935	7.740	45.405	2.439	9.754	40.563
5	1.569	6.276	51.681	1.569	6.276	51.681	2.111	8.445	49.008

Source: Research Data (2023)

Table 4.6 shows the communalities after rotation which represents the relation between the items in the questionnaire. It indicates the proportion of variance in each variable that is accounted for. All the factors were retained for further analysis. All the communalities for factor that retained are above 0.4 as suggested by Costello & Osborne (2005). The lowest communality is 0.416 (The crew members at Your Airline demonstrate a strong commitment to complying with aviation safety regulations and guidelines) and the highest 0.746 (Effective communication and coordination among team members result in maintaining a high level of aviation safety performance).

Table 4.6: Communalities

	Initial	Extraction
SP1	1.000	.442
SP2	1.000	.523
SP3	1.000	.563
SP4	1.000	.651
SP5	1.000	.439
CTAS1	1.000	.734
CTAS2	**1.000**	**.746**
CTAS3	1.000	.718
CTAS4	1.000	.623
CTAS5	1.000	.534
EMAS1	1.000	.595
EMAS2	**1.000**	**.416**
EMAS3	1.000	.551
EMAS4	1.000	.551
EMAS5	1.000	.551
CCAS1	1.000	.478
CCAS2	1.000	.600
CCAS3	1.000	.608
CCAS4	1.000	.559
CCAS5	1.000	.448
TAS1	1.000	.519
TAS2	1.000	.550
TAS3	1.000	.548
TAS4	1.000	.508
TAS5	1.000	.587

Extraction Method: Principal Component Analysis.

Nanny and Berstein (1994) have argued that the Kaiser criterion tends to yield an overestimation of the number of components. In his work published in 2002, Stevens introduced a scree plot as a method for evaluating the appropriate number of statements to be retained in order to solve this particular limitation. The scatter plot depicts the eigenvalues in relation to the number of components, revealing a curve that exhibits an inflection point. The aforementioned data is subsequently employed to ascertain the number of constituents to be extracted. Prior to the point of inflection, the constituent elements of a scree plot serve as indicators for determining the appropriate number of factors to retain. Conversely, subsequent to the point of inflection, the components signify diminishing proportions attributed to each subsequent factor, so suggesting that they should not be retained.

As stated by Norusis (2003), there is often a noticeable discontinuity in the plot between the prominent components located at the vertical slope and the remaining elements situated at the base, which demonstrate a consistent decrease. Based on the findings of this study, it has been observed that there are a total of six (6) components that occur before to the point of inflection on the scree plot, as depicted in Figure 4.1. As a result, a total of six descriptors were considered appropriate for the merged dataset. The scree plot provides confirmation for the decision to maintain six components, as this aligns with the observation of the total variance explained, where eigenvalues are greater than 1.

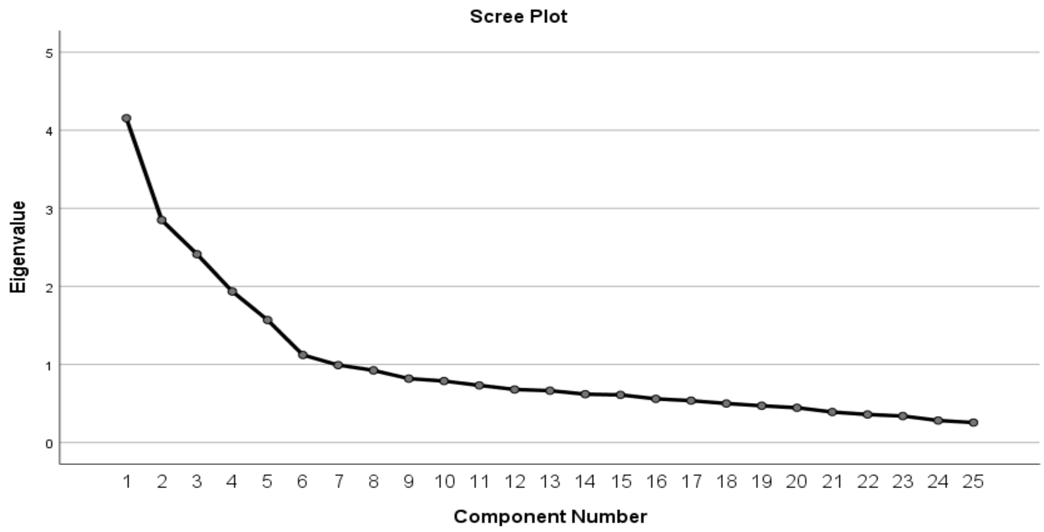


Figure 4.1: Scree Plot

Source: Research Data (2023)

The outcomes of the rotated component matrix, utilizing varimax with Kaiser Normalization rotation, are presented in Table 4.7. The extraction method employed in this study was principal component analysis (PCA) to extract the components. Table 4.7 presents the loadings of each variable on each component, with the exclusion of loadings below the threshold of 0.30, as per the advice put forward by Field (2009). The concept of a rotated component matrix is to decrease the number of factors that exhibit high loadings for the variables being examined.

Table 4.7: Rotated Component Matrix

	1	2	3	4	5
CCAS3	.758				
CCAS2	.757				
CCAS1	.676				
CCAS4	.674				
CCAS5	.640				
EMAS3		.727			
EMAS5		.677			
EMAS1		.659			
EMAS4		.647			
EMAS2		.622			
TAS2			.715		
TAS1			.710		
TAS4			.684		
TAS3			.669		
TAS5			.655		
SP4				.781	
SP3				.712	
SP2				.638	
SP1				.633	
SP5				.615	
CTAS1					.812
CTAS2					.784
CTAS3					.664
CTAS4					.721
CTAS5					.681

Source: Research Data (2023)

4.2 Testing Statistical Assumptions

4.2.1 Normality Test

According to Razali & Wah (2011), studies should not only rely on graphical techniques to determine the distribution of the data, but should also include statistical tools, as well as studying the shape parameters in the coefficients presented by the skewness and kurtosis. Each of the variables examined in this research were put through statistical and graphical tests to determine whether or not they followed a normal distribution. Skewness and kurtosis, were utilized in order to examine the normality of the data. The normal distribution assumes a symmetrical bell-shaped curve with mean μ = 0 and variance σ = 1. A histogram, as shown in Figure 4.2, is a graphical representation of a variable's normal distribution. This indicates the perceived ease of use if a normal distribution is assumed, as shown by the bell-shaped curve

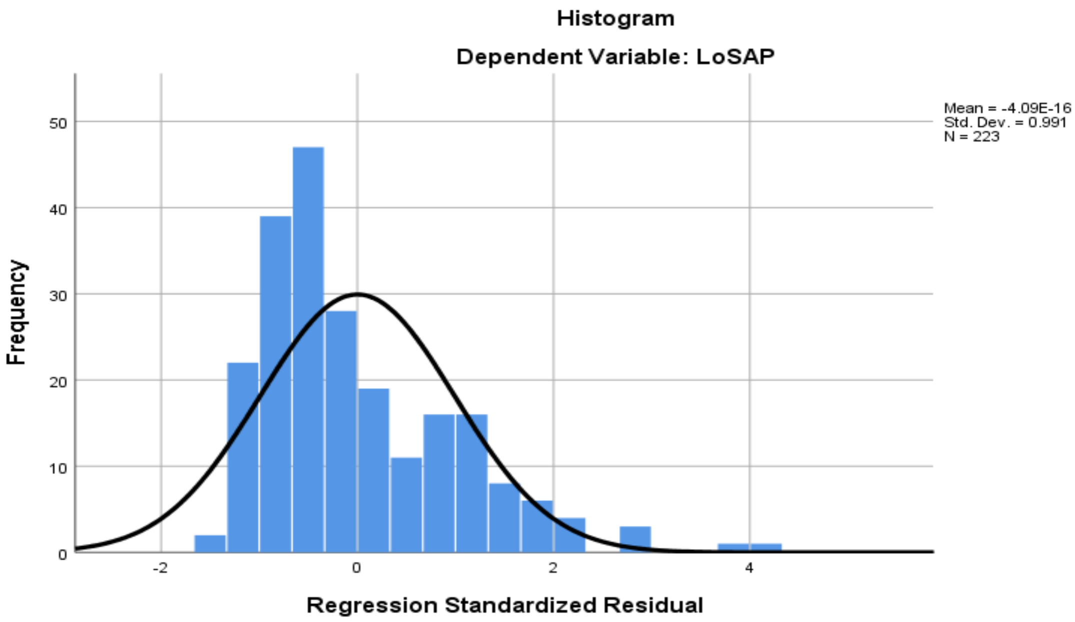


Figure 4.2: Normality Test

Source: Research Data (2023)

The Skewness, as is seen in Figure 4.1 above, refers to the symmetry of the distribution. A distribution that is positively skewed is characterized by a concentration of scores towards the left side, with a tail that extends towards the right. Conversely, a distribution that is negatively skewed is characterized by a concentration of scores towards the right side, with a tail that extends towards the left. According to Hair et al. (2006), all variables presented in table 4.8 exhibited skewness values that fell within the acceptable range of +3 or -3 standard deviations. Skewness numbers that deviate from this range warrant further investigation. Based on the data, the values observed in the study ranged from -0.3.079 to -0.209. Pallant (2007) suggests that the presence of negative or positive skewness is not a concern unless it falls outside the established normal range.

Table 4.8: Normality Test

	N	Min	Max	Mean	Std. Deviation	Skewness	Kurtosis
SAP	223	1.00	5.00	4.6852	.53432	-3.079	14.025
CTA	223	1.60	5.00	4.4726	.55371	-1.300	3.126
EMAS	223	2.60	5.00	4.4879	.51271	-.525	-.542
CCAS	223	3.00	5.00	4.4269	.50152	-.209	-1.051
TAS	223	2.40	5.00	4.5022	.55438	-.757	-.102
Valid N (listwise)	223						

Source: Research Data (2023)

Kurtosis pertains to the degree of peakedness exhibited by a distribution. Positive values of kurtosis indicate a distribution with a pronounced peak, whereas negative values of kurtosis indicate a distribution that is relatively flat. Based on the data presented, the kurtosis values observed ranged from -0.102 to 14.025. This indicates that the variables examined fell within the range specified in table 4.8. Additionally, as stated by Pallant (2007), the presence of negative or positive skewness is not considered problematic until it falls within the normal range.

4.2.2 Multicollinearity Test

Multiple linear regressions assume that there is no multicollinearity in the data. Multicollinearity occurs when the independent variables are too highly correlated with each other. Multicollinearity may be checked multiple ways: Correlation matrix when computing a matrix of Pearson's bivariate correlations among all independent variables. VIF values higher than 10 indicate that multicollinearity is a problem. In addition, tolerance values of less than 0.1 indicate the presence of multicollinearity.

Table 4.9: Multicollinearity Test

	Collinearity Statistics	
Variables	Tolerance	VIF
(Constant)		
SAP	.910	1.099
CTA	.729	1.371
EMAS	.537	1.861
CCAS	.669	1.495
TAS	.942	1.061

Source: Research Data (2023)

As Table 4.9 presents, the Variance Inflation Factor (VIF) was used to test for multicollinearity, which revealed acceptable values which were all within the set values of -10 to 10. To further confirm that there was no Multicollinearity, tolerance values were checked and it was established that they were all above 0.1 which is the accepted standard in line with Creswell (2013).

4.2.3. Test for Autocorrelation

Autocorrelation represents the degree of similarity between a given time series and a lagged version of itself over successive time intervals. Autocorrelation measures the relationship between a variable's current value and its past values. The Durbin Watson (DW) statistic is used test for autocorrelation in the residuals from a statistical regression analysis. The Durbin-Watson statistic will always have a value between 0 and 4. A value of 2.0 means that there is no autocorrelation detected in the sample. Values from 0 to less than 2 indicate positive autocorrelation and values from 2 to 4 indicate negative autocorrelation (Field, 2009). Therefore, from table 4.10 indicated a positive autocorrelation. Thus, the results indicated a significant autocorrelated relationship between all the independent variables and knowledge sharing behaviour. This implied non-violation of the autocorrelation assumptions.

Table 4.10: Autocorrelation Test

Model	Durbin-Watson
Direct Effect	1.887

Source: Research Data (2023)

4.2.4 Test of Homogeneity of Variance

Levene statistic was used to test for homogeneity of variance. Levene's test verified the samples' equivalence of variance, against the acceptable verge of (p >.05) as prescribed by Collis and Hussey (2009). This test examines whether or not the variance between independent and dependent variables is equal. If the Levene's Test for Equality of Variances is statistically significant α=.05 this indicates that the group variances are unequal. It is a check as to whether the spread of the scores in the variables are approximately the same.

Table 4.113: Test of Homogeneity of Variance

	Levene Statistic	df1	df2	Sig.
SAP	.106	1	221	.745
CTA	5.875	1	221	.176
EMAS	.041	1	221	.840
CCAS	2.164	1	221	.143
TAS	4.134	1	221	.170

Source: Research Data (2023)

4.3 Sample Characteristics

The inclusion of sample characteristics is of great significance as it allows for the provision of information regarding the features exhibited by the participants. In addition to demonstrating the representativeness of study samples, demographic characteristics play a crucial role in controlling extraneous influences that may be introduced by these variables to the hypothesized correlations (Hair et al., 2006). Demographic characteristics are commonly portrayed as control variables that are not subject to manipulation. In the present study, the demographic characteristics of gender, age, and experience were considered.

Table 4.124: Demographic Characteristics

		Frequency	Percent
Gender	Male	165	74.0
	Female	58	26.0
	Total	**223**	**100.0**

		Frequency	Percent
Age	Below 30 Years	78	35.0
	30-39 Years	89	39.9
	40-49 Years	45	20.2
	50 Years and above	11	4.9
	Total	**223**	**100.0**

		Frequency	Percent
Experience	1-5 Years	84	37.7
	6-10 Years	109	48.9
	11-15 Years	19	8.5
	above 15 Years	11	4.9
	Total	**223**	**100.0**

Source: Research Data (2023)

In terms of gender, the study findings revealed that majority of the respondents were male (n=165) representing 74.0% of the respondents while (n=58) representing 26.0% of the respondents were female. This implies that there were more males than females in the aviation industry. The results shows also that majority of the respondents (n=89) ranged from between 30 and 39 years old in terms of age representing 39.9% followed by those that ranged Below 30 years (n=78) representing 35.0% of the respondents. Those who were aged between 40-49 years were (n=45) representing 20.2% and finally, those that were over 50 years were (n=11) representing 4.9%. Further, the study findings revealed that in terms of work experience, a majority of the respondents had worked for between 6 to 10 years (n=109) representing 48.9% of the respondents followed by those that had worked for between 1to 5 years (n=84) representing 37.7% of the respondents then those that had worked between 11 and 15 years (n=19) representing 8.5% and finally those that had worked for over 15 years were (n=11) representing 4.9% of the respondents.

4.4 Descriptive Statistics

Garson (2012) asserts that in all forms of quantitative analysis, a fundamental assumption is the presence of accurate measurement that is minimally susceptible to coding errors. Consequently, it is advisable to perform descriptive statistical analysis on the data to ensure that the observed means and standard deviations align with the predicted values. The findings were based on a 5-point Likert scale "1" denoting strongly disagree (SD) "2" denoting as Disagree (D) "3" denoting undecided (U) "4" denoting Agree (A) and "5" denoting Strongly Agree (SA). The descriptive statistics include means and standard deviations. The mean was used as a measure of central tendency, while the standard deviation was used as a measure of dispersion to inform how the responses were dispersed from the mean.

4.4.1 Descriptive Statistics of Safety Aviation Performance

In this study, this variable serves as the dependent variable and is assessed with five items that were retained following factor analysis, each measuring the variable on a five-point Likert scale. In the survey, participants were asked to rate their level of agreement with the items in table 4.13, which characterize safety aviation performance, on a five-point Likert scale.

Table 4.13: Descriptive Statistics of Safety Aviation Performance

Statistics of Safety Aviation Performance	N	Mean	Std. Deviation
The crew members at Your Airline demonstrate a strong commitment to complying with aviation safety regulations and guidelines	223	4.35	1.157
Your Airline has effective processes in place to ensure compliance with aviation safety regulations	223	4.41	1.074
The frequency of safety incidents and accidents has decreased since the implementation of Crew Resource Management (CRM) at Your Airline	223	4.40	1.052
Your Airline demonstrates a strong commitment to emergency preparedness and response following CRM principles	223	4.44	1.015
Your Airline conducts regular drills and exercises to test and enhance crew members' emergency preparedness following CRM training	223	4.38	1.079
Safety Aviation Performance	223	**4.396**	**1.075**

Source: Field Data, 2023

The results shown in Table 4.13 indicate the average score and variability, as measured by the standard deviation, of safety aviation performance items. It is noteworthy to mention that the average response on the 5-point scale utilized in the questionnaire is approximately 4.39, which signifies a general consensus among respondents in favor of the safety aviation performance issues. Furthermore, it is evident that the bulk of the items exhibited a standard deviation within the range of 1.015 to 1.157. It may be inferred that the replies on safety aviation performance did not significantly deviate from the predicted responses, as indicated by the average standard deviation of 1.07.

The majority of the respondents agreed that the crew members at the airline demonstrated a strong commitment to complying with aviation safety regulations and guidelines (Mean = 4.35, SD = 1.157). Similarly, they agreed that their airline has effective processes in place to ensure compliance with aviation safety regulations

(Mean= 4.41; SD=1.074). In the same vein, respondents were in agreement that the frequency of safety incidents and accidents has decreased since the implementation of Crew Resource Management (CRM) at their airline (Mean= 4.40; SD= 1.052). Regarding the statement on your Airline demonstrates a strong commitment to emergency preparedness and response following CRM principles (Mean = 4.44; SD = 1.015). Further, respondents were asked if their airline conducts regular drills and exercises to test and enhance crew members' emergency preparedness following CRM training (Mean= 4.38; SD= 1.079).

4.4.2 Descriptive Statistics of Crew Training

In this study, this variable serves as the independent variable and is assessed with five items that were retained following factor analysis, each measuring the variable on a five-point Likert scale. In the survey, participants were asked to rate their level of agreement with the items in table 4.14, which characterize crew training, on a five-point Likert scale.

Table 4.145: Descriptive Statistics on Crew Training

Crew Training	N	Mean	Std. Deviation
The CRM training at Your Airline has improved my communication skills within the flight crew	223	4.39	.873
The CRM training has positively influenced my ability to communicate and coordinate with other crew members during critical phases of flight	223	4.39	.851
The CRM training has influenced my decision-making process when faced with safety-related challenges during flights	223	4.49	.697
I can recall instances where the CRM training positively impacted my decision-making and led to improved aviation safety performance.	223	4.36	.852
Insights and lessons learned from CRM training and exercises are utilized to enhance safety practices and prevent potential incidents	223	4.51	.643
Crew Training	223	**4.428**	**0.7832**

Source: Field Data, 2023

The findings presented in Table 4.14 demonstrate the mean score and level of dispersion, as assessed by the standard deviation, for crew training indicators. It is important to highlight that the mean response on the 5-point Likert scale employed in the survey is 4.42, indicating a prevailing agreement among participants on the importance of addressing crew training. Moreover, it is apparent that the majority of the items displayed a standard deviation ranging from 0.643 to 0. 873. The data suggests that the responses on crew training did not depart greatly from the projected values, as evidenced by the average standard deviation of 0.783.

Regarding the item on CRM training at your Airline has improved my communication skills within the flight crew, the respondents were in agreement as shown by the mean and standard deviation (Mean =4.39; SD =0.873). The study sought to establish whether the CRM training has positively influenced my ability to communicate and coordinate with other crew members during critical phases of flight. Findings from the analysis revealed that respondents were all in agreement regarding this statement as shown by the mean and standard deviation (Mean = 4.39, SD = 0.851). The majority of the respondents agreed that the CRM training has influenced my decision-making process when faced with safety-related challenges during flights (Mean = 4.49 SD= 0.697). Further, the study established from the respondents that they could recall instances where the CRM training positively impacted my decision-making and led to improved aviation safety performance (Mean = 4.36; SD= 852). Finally, it was revealed that the respondents were in agreement that insights and lessons learned from CRM training and exercises are utilized to enhance safety practices and prevent potential incidents (Mean = 4.51; SD = 0.643).

4.4.3 Descriptive Statistics of Error Management

This variable functions as the independent variable in this study and is measured by five items retained after factor analysis, each measuring the variable on a five-point Likert scale. On a five-point Likert scale, participants were asked to rate their level of agreement with the items on error management listed in table 4.15.

Table 4.156: Descriptive Statistics on Error Management

Error Management	N	Mean	Std. Deviation
The error reporting culture at Your Airline encourages open and transparent reporting of safety-related errors or incidents	223	4.26	.960
Employees feel comfortable reporting safety-related errors or incidents without fear of retribution	223	4.21	.997
Your Airline effectively identifies and categorizes safety-related errors or incidents in its operations	223	4.30	.914
Your Airline promptly responds to reported errors or safety incidents to prevent reoccurrence	223	4.35	.903
Corrective actions and preventive measures are consistently implemented following the identification of errors	223	4.25	.933
Valid N (listwise)	223	**4.274**	**0.9414**

Source: Field Data, 2023

The data displayed in Table 4.15 illustrates the average score and degree of variability, as measured by the standard deviation, for error management parameters. It is crucial to emphasize that the average response on the 5-point Likert scale included in the survey is 4.27, signifying a predominant consensus among participants regarding the significance of addressing error crew. Furthermore, it can be seen that the standard deviation of most of the values was between 0.903 and 0.997. The data shows that the replies to the crew training questionnaire were not wildly different from the predicted values, with a standard deviation of only 0.941 on average.

4.4.4 Descriptive Statistics of Crew Composition

This was the fourth variable and was assessed with five items that were retained following factor analysis, each measuring the variable on a five-point Likert scale. In the survey, participants were asked to rate their level of agreement with the items in table 4.16, which characterize crew composition on a five-point Likert scale.

Table 4.16: Descriptive Statistics of Crew Composition

	N	Mean	Std. Deviation
Your Airline promotes a diverse crew composition in terms of skills and expertise required for safe flight operations	223	4.26	.871
The combination of skills among crew members at your airline contributes to effective problem-solving and decision-making during flights	223	4.32	.784
The crew members at Your Airline work together cohesively as a team during flight operations	223	4.29	.844
The level of experience among crew members positively influences the overall safety performance of Your Airline	223	4.35	.778
Effective communication and cooperation among crew members significantly contribute to enhanced safety outcomes at Your Airline	223	4.35	.877
Valid N (listwise)	223	**4.314**	**0.8308**

Source: Field Data, 2023

The data displayed in Table 4.16 illustrates the average score and degree of variability, as measured by the standard deviation, for error management parameters. It is crucial to emphasize that the average response on the 5-point Likert scale included in the survey is 4.31, signifying a predominant consensus among participants regarding the significance of addressing crew composition. Furthermore, it can be seen that the standard deviation of most of the values was between 0.778 and 0.77. The data shows that the replies to the crew composition questionnaire were not wildly different from the predicted values, with a standard deviation of only 0.30 on average.

The majority of the respondents agreed that their airline promotes a diverse crew composition in terms of skills and expertise required for safe flight operations as depicted by the mean and standard deviation (Mean = 4.26; SD = 0.871). Further, the study sought to establish whether the respondent’s combination of skills among crew members at the airline contributes to effective problem-solving and decision-making during flights. Results from the analysis on this item reveal that majority of the respondent agreed that combination of skills among crew members at the airline contributed to effective problem-solving and decision-making during flights as depicted by the mean and standard deviation (Mean = 4.32, SD = 0.74). The study sought from the respondents to establish whether crew members at the airline worked together cohesively as a team during flight operations as shown by the high mean and low standard deviation (Mean = 4.29, SD = 0.844) respectively. The study sought to find from the respondents if the level of experience among crew members positively influences the overall safety performance of the airline. Results presented revealed a high mean and low standard deviation respectively (Mean = 4.35; SD=0.778), Finally, the respondents were asked to state if effective communication and cooperation among crew members significantly contributed to enhanced safety outcomes. Findings revealed that most respondents were in agreement with the statement as depicted by the high mean and low standard deviation respectively (Mean= 4.35; SD= 0.877).

4.4.5 Descriptive Statistics of Team Work

The study respondents were asked to indicate on a five-point Likert scale their level of agreement on several statements describing team work. This variable is used in this study as the independent variable and the findings from the analysis are as summarized in table 4.17.

Table 4.177: Descriptive Statistics on Team Work

Descriptive Statistics

	N	**Mean**	**Std. Deviation**
Effectiveness of team work programs enhances aviation safety performance	223	4.31	.896
Current team dynamics and collaboration practices within Your aid in improving aviation safety performance?	223	4.37	.839
Effective communication and coordination among team members result in maintaining a high level of aviation safety performance?	223	4.29	.911
Your staff are in satisfaction with the existing teamwork programs in meeting requirement for safety practices.	223	4.39	.803
The team work at Your Airline promotes a safety-focused mindset among all employees	223	4.26	1.014
Valid N (listwise)	223	**4.324**	**0.8926**

Source: Field Data, 2023

Table 4.17 depicts the mean and standard deviation on items relating to team work. On the 5-point scale employed in the questionnaire, the mean response is 4.32 (agree), showing that respondents are largely in agreement with the team work-related questions. It can also be seen that the majority of the items' standard deviations were between 0.803 and 1.014. Then, it can be concluded that the results of statements on team work were not significantly different from the anticipated responses as depicted by the average of 0.892.

As indicated by the mean and standard deviation (mean = 4. 31, SD = 0.896), the majority of respondents agreed that effectiveness of team work programs enhances aviation safety performance. Moreover, it can be deduced from the results of the mean and standard deviation (Mean = 4.37, SD = 0.839), that the vast majority of respondents overwhelmingly so agreed that current team dynamics and collaboration practices within the airline aid in improving aviation safety performance. Respondents were requested to indicate whether or not Effective communication and coordination among team members result in maintaining a high level of aviation safety performance. The calculated mean and standard deviation (mean = 4.29, SD = 0.911) indicate that the respondents concurred with the statement. In the same vein, the majority of those who responded agreed that staff are in satisfaction with the existing teamwork programs in meeting requirement for safety practices (Mean = 4.39, SD = 0.03) and finally, the respondents were asked if the team work at airline promoted a safety-focused mindset among all employees as depicted by the mean and standard deviation respectively (Mean = 4.26, SD = 1.014).

4.5 Correlation Analysis

Pearson correlation coefficient analysis is used to evaluate the direction of linear relationship and the level of strength between variables in the study. According to Gogtay and Thatte (2017), correlation is a term used to indicate the correlation or relationship between two or more quantitative variables. It also measures the strength or magnitude of the association between the variables and their direction. The value of the coefficient can range from -1 to +1, which shows a positive or negative correlation. In this study, Pearson’s Correlation was used to examine the relationship between the study variables. The finding shows that all the associated pairs of safety airline performance with all the variables were significant at 0.01 levels.

Table 4.188: Correlation Analysis Results

	SA	CT	EM	CC	TW
Safety Performance	1				
Crew Training	.208**	1			
Error Management	.209**	.425**	1		
Crew Composition	.195**	.130	.530**	1	
Team Work	.210**	.108	.118	.218**	1

**. Correlation is significant at the 0.01 level (2-tailed).

b. SAP-Safety Performance, CT-Crew Training, EM-Error Management, CC-Crew Composition, TW-Team Work

Table 4.18 provides the results of correlation analysis, examining the relationships between Safety Performance (SAP), Crew Training (CT), Error Management (EM), Crew Composition (CC), and Team Work (TW). The correlation coefficients indicate the strength and direction of associations between these variables.

Safety Performance (SAP) exhibits positive correlations with Crew Training (r = .208**), Error Management (r = .209**), Crew Composition (r = .195**), and Team Work (r = .210**). These positive associations imply that improvements in Crew Training, Error Management, Crew Composition, and Team Work are linked to enhance Safety Performance.

Crew Training (CT) is positively correlated with Safety Performance (r = .208**), suggesting that improvements in Crew Training are associated with better Safety Performance.

Error Management (EM) shows positive correlations with Safety Performance (r = .209**) and Crew Training (r = .425**). This indicates that effective Error

Management is linked to improved Safety Performance and higher levels of Crew Training.

Crew Composition (CC) demonstrates positive correlations with Safety Performance (r = .195**) and Error Management (r = .530**). These correlations suggest that better Crew Composition is associated with enhanced Safety Performance and more effective Error Management.

Team Work (TW) displays a positive correlation with Safety Performance (r = .210**), but the relationship is relatively weaker compared to other variables. This suggests that improved Team Work is linked to better Safety Performance, although the association is not as strong as with other factors.

The correlation coefficients marked with ** are statistically significant at the 0.01 level (2-tailed), indicating a high level of confidence in the observed associations.

4.6 Multiple Regression Analysis

Table 4.19: Model Summary [b]

					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.316[a]	.100	.083	.51154	.100	6.053	4	218	.000

a. Predictors: (Constant), TW(Teamwork), CT(Crew training), CC (Crew composition), EM (Error management)

b. Dependent Variable: ASP (Aviation safety performance)

The Model Summary table provides valuable insights into the regression analysis conducted, focusing on predicting the dependent variable (ASP) based on the predictors: Teamwork (TW), Crew Training (CT), Crew Composition (CC), and Error Management (EM).

In terms of correlation, the coefficient (R) of 0.316 indicates a moderate positive correlation between the predictors and ASP. However, the R Square value of 0.100 suggests that only 10% of the variance in ASP is explained by the combination of Teamwork, Crew Training, Crew Composition, and Error Management. The adjusted R Square, accounting for model complexity, refines this explanation to 8.3%.

The Std. Error of the Estimate, at 0.51154, serves as a measure of prediction accuracy, with smaller values indicating more precise predictions.

Change Statistics reveal a 10% increase in the explained variance (R Square Change), indicating an improvement from the previous model. The F Change statistic, with a value of 6.053 and a significant p-value of 0.000, underscores the overall significance of this change. Degrees of freedom (df1 and df2) provide context for the F Change statistic.

Model specifications include a constant along with the predictors TW, CT, CC, and EM, with ASP as the dependent variable.

In summary, the model suggests a moderate positive correlation between the specified predictors and ASP. The explanatory power, while modest at 10%, gains nuance with the adjusted figure. Change statistics point to a significant improvement in the model, and the predictors collectively contribute to explaining the variance in ASP. Further exploration or refinement may enhance predictive capabilities, and the significance of the predictors is supported by the F Change statistic and its associated p-value.

Table 4.20: ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	6.336	4	1.584	6.053	.000[b]
	Residual	57.046	218	.262		
	Total	63.381	222			

a. Dependent Variable: ASP (Aviation safety performance)

b. Predictors: (Constant), TW(Teamwork), CT(Crew training), CC (Crew composition), EM (Error management)

The ANOVA table offers a comprehensive analysis of variance for the regression model aimed at predicting Aviation Safety Performance (ASP) based on the predictors: Teamwork (TW), Crew Training (CT), Crew Composition (CC), and Error Management (EM).

In the realm of regression analysis, the sum of squares for the regression component stands at 6.336, signifying the variability in ASP that can be attributed to the specified predictors. With 4 degrees of freedom, the mean square for the regression component is 1.584, indicating the average amount of variance explained by the model for each degree of freedom. The F-statistic, with a value of 6.053, assesses the overall significance of the regression model, and in this case, it signals statistical significance.

Turning attention to the residuals or error, the sum of squares is 57.046, representing the unexplained variability in ASP after accounting for the predictors. With 218 degrees of freedom, the mean square for residuals is 0.262, indicating the average unexplained variance per degree of freedom.

Considering the total variability in ASP, which combines both the explained and unexplained components, the sum of squares is 63.381, with a total of 222 degrees of freedom.

The significance level associated with the F-statistic is crucial, and here it is denoted by a p-value of 0.000. This exceptionally low p-value underscores the statistical significance of the regression model.

In summary, the ANOVA table provides a comprehensive insight into the performance of the regression model, revealing the significance of the predictors in explaining the variance in ASP. The separation of variability into its explained and unexplained components enhances the understanding of the model's efficacy. The low p-value associated with the F-statistic further supports the overall statistical significance of the model.

Table 4.21: Regression Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.522	.443		5.695	.000
	CT	.140	.069	.145	2.023	.044
	EM	.078	.087	.075	.891	.374
	CC	.108	.083	.101	1.300	.195
	TW	.158	.064	.164	2.475	.014

a. Dependent Variable: ASP (Aviation Safety Performance)
Predictors: (Constant), TW (Teamwork), CT (Crew training), CC (Crew composition), EM (Error management)

The table presents the outcomes of a multiple linear regression model with Aviation Safety Performance (ASP) as the dependent variable and four independent variables: CT, EM, CC, and TW.

The unstandardized coefficients (B) offer insights into the estimated change in ASP for a one-unit alteration in each respective independent variable. Notably, the intercept (constant) of 2.522 signifies the projected ASP when all independent variables are zero. The coefficients for CT, EM, CC, and TW provide additional information about their individual impacts on ASP.

Standardized coefficients (Beta) convey the change in ASP in terms of standard deviations for a one-standard-deviation shift in the corresponding independent variable. Beta values facilitate the comparison of the relative importance of each variable in influencing ASP.

The t-statistic measures the number of standard deviations by which a coefficient differs from zero. Larger absolute t-values indicate stronger evidence against the null hypothesis that the coefficient is equal to zero.

Significance levels (Sig.) reveal the probability of observing a given t-statistic if the null hypothesis holds true. A Sig. value less than 0.05 is commonly used as a threshold, indicating statistical significance and implying a noteworthy effect of the corresponding variable on ASP.

The constant term, representing the intercept, showcases the estimated ASP when all independent variables are zero. It serves as a crucial component of the regression equation.

This table comprehensively communicates the relationships between the independent variables (CT, EM, CC, TW) and the dependent variable (ASP) in the regression model. Analysts can utilize the standardized coefficients and significance levels to assess the relative importance and reliability of each variable, thereby gaining insights into the dynamics of aviation safety performance.

In this section, the analysis of the relationship between Aviation Safety Performance and CRM (Crew Resource Management) practices is reported. Specifically, the focus is on CRM Training (CT), Error Management (EM), Crew Composition (CC), and Team Work (TW) as factors influencing aviation safety. To rigorously examine how these factors relate to Aviation Safety Performance, advanced statistical techniques were employed, specifically, a multiple linear regression analysis. This analytical approach allowed for the investigation of the complex interplay between CRM practices and safety outcomes in the aviation sector.

The foundation of the analysis is a multiple linear regression model, expressed by the following equation:

$$Y=\beta 0+\beta 1\cdot CT+\beta 2\cdot EM+\beta 3\cdot CC+\beta 4\cdot TW+\varepsilon$$

In this equation:

Y represents Aviation Safety Performance, the dependent variable under investigation.

CT, EM, CC, and TW denote the independent variables, corresponding to CRM Training, Error Management, Crew Composition, and Team Work, respectively.

$\beta 0$ signifies the intercept term, reflecting the baseline level of Aviation Safety Performance in the absence of CRM practices.

$1\beta 1$, $2\beta 2$, $3\beta 3$, and $4\beta 4$ represent the regression coefficients, quantifying the strength and direction of the relationships between each CRM practice and Aviation Safety Performance.

ε accounts for the error term, encompassing unexplained variance in Aviation Safety Performance.

The data analysis was conducted using SPSS (Statistical Package for the Social Sciences) software.

Aviation Safety Performance was modeled as:

$$ASP = 2.522 + 0.140 * CT + 0.078 * EM + 0.108 * CC + 0.158 * TW + \varepsilon$$

In this equation:

"Aviation Safety Performance" represented the dependent variable, which was the outcome the researcher sought to understand and predict.

CT, EM, CC, and TW were independent variables representing CRM Training, Error Management, Crew Composition, and Team Work, respectively.

The constant term 2.522 is the y-intercept, the expected value of ASP when all independent variables are zero.

The coefficients (2.522, 0.140, 0.078, 0.108, and 0.158) were estimated values for the regression coefficients, determining the impact of each independent variable on Aviation Safety Performance.

ε signified the error term, representing the unexplained variability in Aviation Safety Performance that was not accounted for by the independent variables.

With these specific coefficient values, the equation quantified how changes in CRM Training, Error Management, Crew Composition, and Team Work were associated with changes in Aviation Safety Performance. For instance:

A one-unit increase in CRM Training (CT) was associated with an increase of 0.140 units in Aviation Safety Performance, while holding other factors constant.

Similarly, a one-unit increase in Error Management (EM) was associated with an increase of 0.078 units in Aviation Safety Performance, with other variables held constant.

Crew Composition (CC) had a smaller impact, with a one-unit increase resulting in an increase of 0.108 units in Aviation Safety Performance.

Team Work (TW) had a moderate impact, with a one-unit increase associated with an increase of 0.158 units in Aviation Safety Performance.

These coefficient values provided specific insights into how each CRM practice influenced Aviation Safety Performance in the context of this regression model, as reported by the researcher.

4.7 Hypotheses Testing

This section presents the hypotheses test results. A total of four hypotheses were set in their null form informed by the corresponding specific objectives of the study. To achieve this, linear various regression analyses was performed.

4.7.1 Test for Direct Effects

A simple linear regression analysis was performed to calculate the coefficients of independent variables with aviation safety performance. A correlation value (R) of .316 was recorded in Model 1 indicating a linear relationship between the independent variables crew training, error management, crew composition and team work and safety aviation performance. An R Square of .010 was also recorded implying that only 1.0%% of the variation in safety aviation performance is accounted for by crew training, error management, crew composition and team work while the residual 99% is attributed to other factors not factored in this regression model. An F value of 6.053

was further revealed with a P value of 0.000 (<0.05) indicating that the adopted regression model is statistically significant and can be used to make further inferences.

Table 4.22: Coefficient Results for Direct Effect

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	2.522	.443		5.695	.000
	Crew Training	.140	.069	.145	2.023	**.044**
	Error Management	.078	.087	.075	.891	.374
	Crew Composition	.108	.083	.101	1.300	.195
	Team Work	.158	.064	.164	2.475	**.014**

a. Dependent Variable: Safety Aviation Performance

Summary Statistics	
R	0.316
R-Square	0.100
Adjusted R Square	0.083
Standard Error of Estimate	0.51154
Change Statistics	
F Change	6.053
Df1	4
Df2	218
Sig. F Change	0.000

Source: Field Data, 2023

The first hypothesis of the study **H_{01}:** predicted that there is no significant effect of crew training on aviation safety performance in low-cost carrier airlines in Kenya. Findings revealed a positive and significant effect between crew training and aviation safety performance (β = 0.140, p = 0.044, <0.05) implying that crew training leads to an enhanced aviation safety performance. Thus, we reject the null hypothesis and a conclusion is made that crew training has a significant effect on aviation safety performance. This finding echoed the results of Chang, Liao and Kuo (2013) whose study showed that the training syllabus positively affects skills-learning, skills-learning positively affects operational performance and flight safety performance, and operational performance directly affects flight safety performance. It also lends support to the findings of Kimotho (2016) who concluded that there was a positive significant relationship between air safety performance and management support for training.

The second hypothesis of the study **H_{02}:** proposed that there is no significant effect of error management on aviation safety performance in low-cost carrier airlines in Kenya. Results presented in table 4.22 revealed that there was a positive and insignificant effect between error management and safety aviation performance ($\beta = 0.078$, $p = 0.374$, >0.05) implying that error management does not lead to safety aviation performance. The null hypothesis is therefore upheld and a conclusion made that error management has no significant effect on safety aviation performance.

The third hypothesis **H_{03}** stated that there is no significant effect of crew composition on aviation safety performance in low-cost carriers' airlines in Kenya. Findings from the analysis revealed that there was a positive and insignificant effect between crew composition and safety aviation performance ($\beta = 0.108$, $p = 0.195$, >0.05) implying that crew composition does not lead to safety aviation performance. The null hypothesis is therefore upheld and conclusion made that that crew composition has no significant effect on safety aviation performance.

The fourth hypothesis **H_{04}** stated that there is no significant effect of teamwork on aviation safety performance in low-cost carriers' airlines in Kenya. Findings from the analysis revealed that there was a positive and significant effect between teamwork and safety aviation performance ($\beta = 0.158$, $p = 0.014$, <0.05) implying that teamwork leads to an increase in safety aviation performance. The null hypothesis is therefore rejected and a conclusion made that teamwork has a significant effect on safety aviation performance.

4.8 Summary of Hypotheses Testing Results

The results presented in Table 4.23 below indicated the summary of simple regression model. Thus, the table shows the beta values, p-values as well as the decision on the formulated hypothesis as shown in table 4.23.

Table 4.239: Summary of Hypotheses Testing Results

Hypothesis formulated		**Beta**	**p-values**	**Decision**
	Main Effect			
HO1:	there is no significant effect of crew training on aviation safety performance in low-cost carrier airlines in Kenya	0.140	0.044	Reject
HO2:	there is no significant effect of error management on aviation safety performance in low-cost carrier airlines in Kenya	0.078	.374	Fail to Reject
HO3:	there is no significant effect of crew composition on aviation safety performance in low-cost carriers' airlines in Kenya.	0.108	.195	Fail to Reject
HO4:	that there is no significant effect of teamwork on aviation safety performance in low-cost carriers' airlines in Kenya	0.158	.014	Reject

The findings from the hypotheses testing in Table 4.20 reveal crucial insights into the determinants of aviation safety performance in low-cost carrier airlines in Kenya. Notably, the results indicate a significant positive effect of crew training and teamwork, as evidenced by the rejection of null hypotheses HO1 and HO4. This underscores the importance of investing in crew training programs and fostering effective teamwork to enhance safety outcomes in this context. On the other hand, the study does not find sufficient evidence to reject the null hypotheses related to the impact of error management (HO2) and crew composition (HO3) on aviation safety performance, suggesting that these factors may not exert a significant influence. These nuanced findings contribute valuable information for stakeholders in the aviation industry, guiding decision-making processes and emphasizing targeted interventions to improve safety practices within low-cost carrier airlines in Kenya.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the study findings as guided by the specific objectives and the hypotheses of the study. It also presents the conclusion drawn from the findings of the study as well as the recommendations and direction for future research.

5.2 Summary of Findings

The study conducted an analysis of the relationship between Aviation Safety Performance (ASP) and Crew Resource Management (CRM) practices, specifically focusing on CRM Training (CT), Error Management (EM), Crew Composition (CC), and Team Work (TW). Advanced statistical techniques, including correlation analysis and multiple linear regression analysis, were employed to examine the complex interplay between these factors and safety outcomes in the low-cost carrier airlines in Kenya.

5.2.1 Effect of Crew Training on Aviation Safety Performance

The first objective of the study was to ascertain the effect of Crew training on aviation safety performance in low-cost carriers. It was hypothesized that there is no statistically significant effect of crew training on aviation safety performance in Low-cost carriers. The descriptive statistics results of this objective showed that the aggregate high mean response rate indicating that respondents generally agreed on the items relating to crew training. It can also be observed that the overall standard deviation for crew training is low implying the responses are confined within a small range about the overall mean response. Results indicate that there was a positive and significant effect between crew training and aviation safety performance implying that crew training leads to an enhanced aviation safety performance. Thus the null hypothesis was rejected, thereby making conclusion that crew training has a significant effect on aviation safety performance.

5.2.2 Effect of Error Management on Aviation Safety Performance

The second objective of the study was to establish the effect of error management on aviation safety performance in low-cost carrier. It was hypothesized that there is no statistically significant effect of error management on aviation safety performance in Low-cost carriers. The descriptive statistics results of this objective showed that the aggregate mean response was high indicating that respondents generally agreed on the items relating to error management. It can also be observed that the overall standard deviation for crew training is low implying the responses are confined within a small range about the overall mean response. Confirmatory factor analysis was conducted to establish sample adequacy which yielded KMO of 0.745. This result provided justification for further statistical analysis to be conducted. Results indicated a positive and insignificant effect between error management and aviation safety performance implying that error management does not lead to safety aviation performance. The null hypothesis is therefore upheld and a conclusion made that error management has no significant effect on safety aviation performance.

5.2.3 Effect of Crew Composition on Safety Performance

The third objective of the study was to determine how crew composition affects aviation safety performance in low-cost carriers. It was hypothesized that there is no statistically significant effect of crew composition on aviation safety performance in Low-cost carriers. The descriptive statistics results of this objective showed that the aggregate mean response was high indicating that respondents generally agreed on the items relating to crew composition. It can also be observed that the overall standard deviation for crew composition is low implying the responses are confined within a small range about the overall mean response. Confirmatory factor analysis was conducted to establish sample adequacy which yielded KMO of 0.745. This result provided justification for further statistical analysis to be conducted. Findings from the analysis revealed that there was a positive and insignificant effect between crew composition and safety aviation performance implying that crew composition does not lead to safety aviation performance. The null hypothesis is therefore upheld and conclusion made that crew composition has no significant effect on safety aviation performance.

5.2.4 Effect of Team Work on Aviation Safety Performance

The fourth objective of the study sought to examine the effect of team work on aviation safety performance in low-cost carriers. It was hypothesized that there is no statistically significant effect of teamwork on aviation safety performance in Low-cost carriers. The descriptive statistics results of this objective showed that the aggregate mean response was high indicating that respondents generally agreed on the items relating to team work. It was also be observed that the overall standard deviation for team work was low implying the responses are confined within a small range about the overall mean response. Confirmatory factor analysis was conducted to establish sample adequacy which yielded KMO of 0.745. This result provided justification for further statistical analysis to be conducted. Findings from the analysis revealed that there was a positive and significant effect between teamwork and safety aviation performance implying that teamwork leads to an increase in safety aviation performance. The null hypothesis is therefore rejected and a conclusion made that teamwork has a significant effect on safety aviation performance.

5.3 Conclusion of the Study

In conclusion, this study illuminates the intricate relationship between crew training and aviation safety performance within the realm of low-cost carriers. Navigating through the data landscape, entwining descriptive statistics with insights drawn from regression analysis, the study unfolds a narrative that resonates with the broader context established by past studies.

The resounding endorsement, as evidenced by an aggregate mean response of approximately 4.39 from the respondents, serves as a compelling validation of the profound significance of crew training in this specific domain. This aligns with sentiments expressed in studies such as Gregorich (2020), emphasizing the positive impact of Crew Resource Management (CRM) training on teamwork and communication. Consensus among empirical findings reinforces the foundation laid by past research, solidifying the argument that well-crafted crew training programs are integral to elevating safety performance.

Delving into the statistical realm reveals a positive and statistically significant relationship between crew training and aviation safety performance ($\beta = 0.140$, $p = 0.044$, <0.05). This empirical revelation resonates with the broader discourse found in literature, aligning with insights from studies such as Smith's (2018) investigation into error management training and its impact on reducing accidents. This correlation bridges the current study's findings with the broader tapestry of knowledge.

By aligning our empirical evidence with the echoes of past research, the study engages in a rich conversation with the existing literature. This synthesis of findings not only bolsters the credibility of the present study but also contributes to the broader understanding of the consistent and crucial role of crew training in ensuring aviation safety within low-cost carriers.

As this exploration concludes, it extends a beckoning call to the aviation industry, especially low-cost carriers, to heed the echoes of past research and the resounding affirmations within our findings. The rejection of the null hypothesis becomes a not only a statistical outcome but a resonant call for strategic investment in crew training initiatives. Embracing this imperative, rooted in both current evidence and the echoes of past studies, becomes not only a practical necessity but a visionary step towards fostering enduring safety and resilience in the dynamic realm of air travel.

The study's findings, anchored in Human Factors Theory, High Reliability Theory, Organizational Learning Theory, and Safety Culture Theory, clarify the nuanced interplay between Crew Resource Management (CRM) practices and aviation safety performance at Safarilink, JamboJet, and Skyward Airlines.

Human Factors Theory, emphasizing human capabilities, limitations, and behaviors, provides a lens to comprehend the intricate dynamics of crew training. The study's revelations align with this theory, showcasing how well-structured and comprehensive crew training significantly influences safety outcomes, addressing fallibility through effective communication and teamwork.

High Reliability Theory (HRT) offers a framework to understand CRM's impact on aviation safety. The study mirrors HRT principles, revealing CRM's role in preoccupation with failure, sensitivity to operations, reluctance to simplify interpretations, commitment to resilience, and deference to expertise. CRM practices, as indicated by the findings, align harmoniously with these principles, fostering a highly reliable and safe operational environment.

Organizational Learning Theory (OLT) sheds light on how Safarilink, JamboJet, and Skyward Airlines acquire, interpret, and apply knowledge through CRM. The study underscores how CRM contributes to the organization's learning dynamics, ensuring continuous improvement. It unravels the intricate process of how CRM insights are integrated into operational procedures, policies, and guidelines, driving a culture of learning and adaptation.

Safety Culture Theory (SCT) becomes the cornerstone to understand CRM's role in shaping the safety culture at the airlines. The findings showcase how CRM principles align with the organization's safety culture, fostering a commitment to safety, open communication, teamwork, and error management. The study explores how CRM and safety culture interact in decision-making, risk assessment, and error management, reinforcing the airline's resilience and capacity to learn from experiences.

In essence, the study not only validates established theories but elevates them through empirical evidence. It links CRM practices to broader theoretical frameworks, offering a comprehensive understanding of how crew training, error management, crew composition, and teamwork contribute to aviation safety performance at Safarilink, JamboJet, and Skyward Airlines. This holistic perspective not only validates the significance of CRM but provides actionable insights for strategic enhancements, fostering a safer and more resilient air travel environment.

5.4 Limitations of the Study

The main limitation faced in the study was generalization of findings to the aviation industry in the country, as organizations outside Kenya could have factors unique to their respective sub-sectors which were not subject in this study. To address this limitation, the study generalized the recommendations only to the Kenyan context. The study also suggested further studies be conducted in other countries to determine any similarities, patterns and trend.

Further, questionnaire filling and returning depended on the participants' willingness and time availability, exposing the study to non-response. The "drop and pick" technique was adopted to address this, where participants were given ample time to fill the questionnaire at their convenience after which they informed the researcher when dully filled for collection. Despite the above limitations, the quality of the study was not compromised.

5.5 Recommendation of the Study

5.5.1 Practice and Management

In light of the study's insightful findings, it is imperative for low-cost carriers to prioritize continuous evaluation and enhancement of their crew training programs. The aviation industry is dynamic, with emerging technologies and evolving standards. Therefore, a proactive approach to regularly assessing and improving training initiatives is crucial. A particular focus should be directed towards the integration of simulation-based training, mirroring real-world scenarios. This immersive training environment ensures that the flight crew is exposed to a diverse range of situations, fostering adaptability and refining decision-making skills. Additionally, embracing cross-training initiatives is recommended to familiarize crew members with various roles, promoting team flexibility and collaborative problem-solving—an aspect aligned with the study's emphasis on Crew Resource Management (CRM) training (Houtman, 2018).

5.5.2 Recommendations on Policy

The management of low-cost carriers should adopt policies that reflect adaptability to the ever-evolving aviation landscape. A flexible policy framework is essential to accommodate changes in technology, regulations, and industry best practices. Moreover, incentivizing ongoing education and training should be a central policy focus. By providing tangible incentives for crew members to engage in continuous learning, carriers can cultivate a culture of knowledge advancement and skill enhancement. These policies not only align with the study's findings but also resonate with the overarching theme of prioritizing crew competence and proficiency, as highlighted in research by Gregorich (2020) and Helmreich et al. (2016).

5.5.3 Theoretical Implications

Theoretical implications derived from this study emphasize the need to integrate human factors more deeply into crew training programs. Going beyond technical expertise, understanding psychological and interpersonal aspects is essential for optimizing crew coordination, communication, and decision-making. This recommendation aligns seamlessly with the studies conducted by Johnston (2017) and Alemi, Torabi, & Carreno (2018), underlining the significance of Crew Resource Management in reducing human errors and enhancing safety outcomes.

Furthermore, to ensure the longevity of positive training impacts, it is advisable to support longitudinal studies tracking the ongoing effects of crew training on safety performance. Compliance with regulations, as emphasized by Helmreich et al. (2016), should not be viewed as a one-time endeavor but as an ongoing commitment. Longitudinal studies provide a holistic understanding of the sustained effects of training, guiding carriers in their efforts to consistently meet and exceed safety standards. Thus, these theoretical implications, intertwined with empirical findings, serve as a comprehensive guide for low-cost carriers aiming to enhance aviation safety practices and uphold industry excellence.

5.6 Recommendation for Further Studies

Based on the findings of study, the researcher recommends the following areas for further study:

Explore the efficacy of integrating technological advancements such as virtual reality and artificial intelligence into crew training programs for enhanced safety outcomes.

Conduct a longitudinal study to assess the sustained effects of error management strategies, providing insights into the long-term impact of organizational learning from errors on aviation safety.

Investigate how cultural diversity among flight crews influences team dynamics and its subsequent impact on aviation safety.

REFERENCES

Agnes, A. (2015). Neural network model for predicting building projects' contingency. *n Conference: proceedings of association of researchers in construction management* , (pp. (Vol. 96, pp. 507-16)).

Alavi, M. (2020). *Foundation of Factor Analysis.* London: Statistical Analysis.

Babbie, E. (2016). *The Practice of Social Research (14th ed.).* Cengage Learning.

Babbie, S. (2016). *Safety performance of airlines: An overview of their types, rationales, and impacts: A global perspective.* Berlin: Springer.

Babbie, W. (2016). *Crew Resource Management in Navigation operation.* NewYork: Aviation Publication .

Barton, G. (2015). The effects of construction delays on project delivery in Nigerian construction industry. *Australian Journal of Construction Education*, 166-177.

Borenstein, S. (2014). The evolution of U.S. airline competition. Journal of Economic Perspectives, 18(4), . *Journal of Economic Perspectives*, 169-190.

Brown, C. (2019). Teamwork and safety of aviation operations. *Aviation Safety Journal*, 44-67.

Button, K. (2017). *Crew resource management: A contemporary safety piloting appraisal.* Routledge.

Button, W. (2017). *Strategic approach to Identification and prevention of errors in Organizations.* Aviation Safety Management.

Caspari, F. (2015). Crew resource management in the US airline industry: An analysis of current trends. *Low-cost Sustainability Conference.*

Cate, A.-S. (2021). *he evolution of Crew Resource Management training in commercial aviation: Evidence from low-cost carriers.* Makkah: Med Res.

Cate, W. (2021, October 24). More Alarming Administrative decision Stats for 2021! Retrieved from: https://www.forbes.com/sites/chuckbrooks/2021/10/24/more-alarming-cybersecurity-stats-for-2021-/?sh=3f827fc54a36. pp. 74-79.

Chambers, B. (2015). *Implementing Crew resource management competency-based education in colleges and universities.* New York: Routledge.

Charles, K. (2019). An analysis of Crew resource management differences alliances between low-cost carriers and full-service airlines. *Journal of Air Transport Management*, 20-31.

Cochran, G. (1977). *Sampling Techniques (3rd ed.).* Wiley.

Coll, D. (2019). *Crew resource management. Sustainable piloting competence through training.*

Creswell, W. (2014). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches.* SAGE Publications.

Debok, M. (2016). *Crew resource management planning for low-cost airlines.* Montana: Periodica Polytechnica Transportation Engineering.

Doganis, R. (2016). *Crew resource management in the airline business in the 21st century (2nd ed.).* New York: Routledge.

Gregorich, A. (2020). *Role of Crew Resource Management in enhancing flight communication within the cockpit.*

Gronlund, T. (2017). *Detection efficiency on an Crew resource management Training task with and without on job training.* Aviation, Space, and Environmental Medicine.

Gulikers, B. (2017). *Teacher competencies for implementing competence-based education.* Teacher Development .

Harison, M. (2015). The pedagogy of competency-based education. *Journal of Competency-Based Education*, 1(1), 1-7.

Helmreich, K. (2016). *Crew resource management and aviation safety performance for airlines not more than 10 years old.*

IATA. (2021). *Aviation safety incidents and reports for European airspace.* Florida: Internationa Air Transport Association.

ICAO. (2019). *Safety incidents and hazards in aviation contracting states.* Geneva: International Civil Aviation Organization.

John, W. (2015). *The global airline industry.*. Chile: Newread.

Jorgensen, D. (2015). *Pedagogy for competence development in higher education.* Dordrecht: Springer.

Kiernan, K. (2021). *Competence as the solution to long standing skill gap in Crew resource management. A longitudinal Study. Population Studies.*

Klink, B. (2019). *The role of strategic alliances in low cost airlines – A study of AirAsia.* Dordrecht: Springer.

Koestner, R. (2019, January). Need satisfaction, motivation, and well-being in the work organizations of a former eastern bloc country. *Air transport monthly*, pp. 147-159.

Koo, L. (2018). The role of low-cost carriers' Crew resource management enhancing operational performance. *Journal of Air Transport Management*, 13-22.

Laaser, S. (2018). *The evolution of the airline industry.* Berlin: Springer.

Makhanya, M. (2020). *Examining the Crew resource management factors affecting low-cost carrier in fight safety. Research of Air Transport Managemen.*

Makhaya, S. (2020). *Does crew resource management training work? A multilevel analysis of airline–airport relationships.* Washington, DC: American Psychological Association.

Mesut, A. (2016). *Influences of Crew resource management capacity in the empowerment of good safety perfoarmance in Aviation Institutions in Gabon.*

Najar, R. (2017). *Examining the factors affecting Crew resource management in low-cost carrier. Air Transport Management.* New York: Palgrave Macmillan.

Odukoya, M. (2017). *Airline networks: Toward a theory of situation awareness in dynamic systems.* Routledge.

Odukoya, M. (2017). *The role of teaching and learning materials in the implementation of Competenct Based Training Programs.*

Park, Z. (2018). Low-cost airlines: stimulation of air travel market, competition regulation, and spatial implications. *Journal of Transport Geography,*, 34--47.

Porter, M. (2001). *Organization Learning Theory.*

Prahalad, H. (1990). *The core competence of the corporation. Harvard business review.* Havard business review.

Resnic, A. (2020). *The impact of Crew resource management on the performance of low-cost carriers: Evidence from Southeast Asia.* Atlanta: Air Transport publishers.

Sam, l. (2018). The effects of low-cost carriers' strategic alliance on customers' satisfaction and loyalty. *Journal of Air Transport Management*, 147-156.

Stanley, M. (2016). *The role of airline alliances for low-cost carriers. Air Transport Management.* Montenegro: Air Navigation management.

Vansteenkiste, P. (2019). *Composition of crew as a component of aviation safety.*

Vansteenkiste, S. (2019). Motivating learning, performance, and persistence: The synergistic effects of Crew resource management in piloting. *Journal of Air Transport Management*, 1239-1252.

Zhang, P. (2017). *The impact of low-cost carriers on airport and route competition.* Transportation Research, Logistics and Transportation Review.

APPENDICES

Appendix I: Questionnaire

Dear respondent,

Kindly answer the following questions to the best of your knowledge. The information obtained from this interview is strictly for academic purposes.

SECTION A: Demographic Information

Gender:

Male [ ] Female [ ]

Age bracket

Below 30 yrs [ ] 30-39yrs [ ]

40-49 yrs [ ] 50 yrs and above [ ]

Work experience?

1-5 years [ ] 6-10 years [ ]

11-15 years [ ] above 15 years [ ]

Briefly introduce yourself and your role at your airline?

Tell me about the implementation of CRM at your airline?

SECTION B: Safety performance in aviation

Please indicate with a tick √ the extent to which you agree with any of the following statement concerning Crew training and aviation safety in your organization. Use the scale where 1: Strongly disagree 2: Disagree, 3: Neutral, 4: Agree, 5: Strongly Agree

Safety performance	1	2	3	4	5
The crew members at Your Airline demonstrate a strong commitment to complying with aviation safety regulations and guidelines					
Your Airline has effective processes in place to ensure compliance with aviation safety regulations					
The frequency of safety incidents and accidents has decreased since the implementation of Crew Resource Management (CRM) at Your Airline					
Your Airline demonstrates a strong commitment to emergency preparedness and response following CRM principles					
Your Airline conducts regular drills and exercises to test and enhance crew members' emergency preparedness following CRM training					

SECTION C: Crew training and aviation safety

Please indicate with a tick √ the extent to which you agree with any of the following statement concerning Crew training and aviation safety in your organization. Use the scale where 1: Strongly disagree 2: Disagree, 3: Neutral, 4: Agree, 5: Strongly Agree

Crew training and aviation safety	1	2	3	4	5
The CRM training at Your Airline has improved my communication skills within the flight crew					
The CRM training has positively influenced my ability to communicate and coordinate with other crew members during critical phases of flight					
The CRM training has influenced my decision-making process when faced with safety-related challenges during flights					
I can recall instances where the CRM training positively impacted my decision-making and led to improved aviation safety performance.					
Insights and lessons learned from CRM training and exercises are utilized to enhance safety practices and prevent potential incidents					

SECTION D: Error management and aviation safety

Please indicate with a tick √ the extent to which you agree with any of the following statement concerning Error management and aviation safety in your organization. Use the scale where 1: Strongly disagree 2: Disagree, 3: Neutral, 4: Agree, 5: Strongly Agree

Error management and aviation safety	1	2	3	4	5
The error reporting culture at Your Airline encourages open and transparent reporting of safety-related errors or incidents					
Employees feel comfortable reporting safety-related errors or incidents without fear of retribution					
Your Airline effectively identifies and categorizes safety-related errors or incidents in its operations					
Your Airline promptly responds to reported errors or safety incidents to prevent reoccurrence					
Corrective actions and preventive measures are consistently implemented following the identification of errors					

.

SECTION E: Crew composition and aviation safety

Please indicate with a tick √ the extent to which you agree with any of the following statement concerning Crew composition and aviation safety in your organization. Use the scale where 1: Strongly disagree 2: Disagree, 3: Neutral, 4: Agree, 5: Strongly Agree

Crew composition and aviation safety	1	2	3	4	5
Your Airline promotes a diverse crew composition in terms of skills and expertise required for safe flight operations					
The combination of skills among crew members at Your Airline contributes to effective problem-solving and decision-making during flights					
The crew members at Your Airline work together cohesively as a team during flight operations					
The level of experience among crew members positively influences the overall safety performance of Your Airline					
Effective communication and cooperation among crew members significantly contribute to enhanced safety outcomes at Your Airline					

SECTION F: Teamwork and aviation safety

Please indicate with a tick √ the extent to which you agree with any of the following statement concerning Team work and aviation safety in your organization. Use the scale where 1: Strongly disagree 2: Disagree, 3: Neutral, 4: Agree, 5: Strongly Agree

Team work	1	2	3	4	5
Effectiveness of team work programs enhances aviation safety performance					
Current team dynamics and collaboration practices within Your aid in improving aviation safety performance?					
Effective communication and coordination among team members result in maintaining a high level of aviation safety performance?					
Your staff are in satisfaction with the existing teamwork programs in meeting requirement for safety practices.					
The team work at Your Airline promotes a safety-focused mindset among all employees					

Thanks for your cooperation.

a

Appendix II: SPSS Output

Factor Analysis

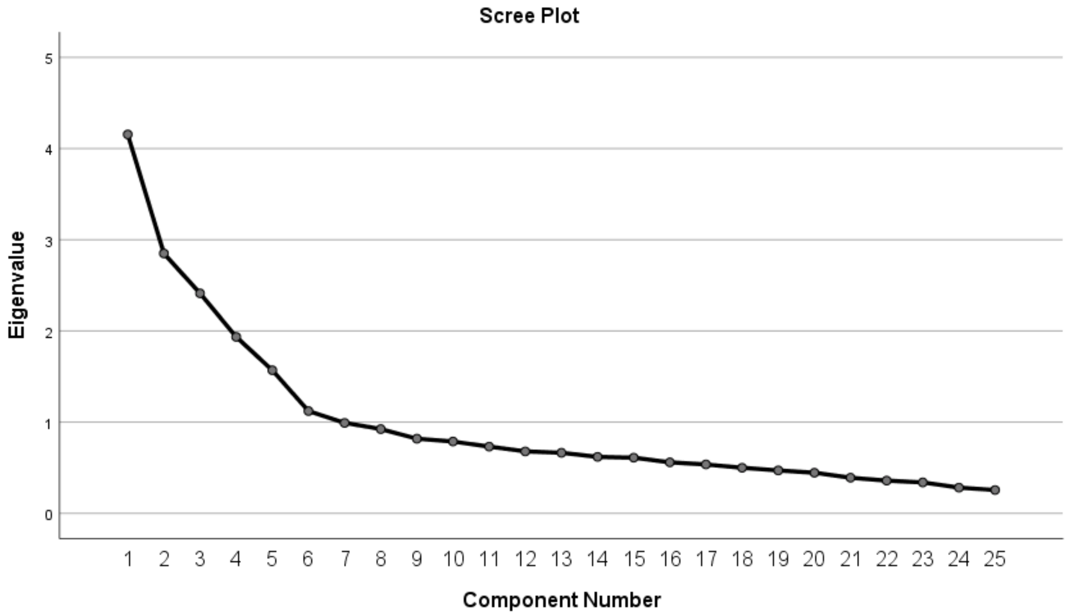
KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.745
Bartlett's Test of Sphericity	Approx. Chi-Square	1527.930
	Df	300
	Sig.	.000

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.155	16.619	16.619	4.155	16.619	16.619	2.777	11.107	11.107
2	2.850	11.399	28.019	2.850	11.399	28.019	2.476	9.903	21.010
3	2.412	9.647	37.666	2.412	9.647	37.666	2.450	9.799	30.809
4	1.935	7.740	45.405	1.935	7.740	45.405	2.439	9.754	40.563
5	1.569	6.276	51.681	1.569	6.276	51.681	2.111	8.445	49.008
6	1.121	4.485	56.167	1.121	4.485	56.167	1.790	7.158	56.167
7	.992	3.967	60.133						
8	.924	3.695	63.828						
9	.818	3.273	67.101						
10	.787	3.149	70.250						
11	.732	2.926	73.176						
12	.679	2.716	75.892						
13	.663	2.654	78.545						
14	.619	2.476	81.021						
15	.610	2.441	83.462						
16	.559	2.238	85.700						
17	.536	2.143	87.843						
18	.499	1.997	89.840						
19	.470	1.882	91.722						
20	.445	1.779	93.500						
21	.390	1.561	95.062						
22	.359	1.434	96.496						
23	.339	1.356	97.852						
24	.282	1.126	98.979						
25	.255	1.021	100.000						

Extraction Method: Principal Component Analysis.



	1	2	3	4	5
The crew members at Your Airline work together cohesively as a team during flight operations	.758				
The combination of skills among crew members at Your Airline contributes to effective problem-solving and decision-making during flights	.757				
Your Airline promotes a diverse crew composition in terms of skills and expertise required for safe flight operations	.676				
The level of experience among crew members positively influences the overall safety performance of Your Airline	.674				
Effective communication and cooperation among crew members significantly contribute to enhanced safety outcomes at Your Airline	.640				
Your Airline effectively identifies and categorizes safety-related errors or incidents in its operations		.727			
Corrective actions and preventive measures are consistently implemented following the identification of errors		.677			
The error reporting culture at Your Airline encourages open and transparent reporting of safety-related errors or incidents		.659			
Your Airline promptly responds to reported errors or safety incidents to prevent reoccurrence		.647			
Employees feel comfortable reporting safety-related errors or incidents without fear of retribution		.622			
Current team dynamics and collaboration practices within Your aid in improving aviation safety performance?			.715		
Effectiveness of team work programs enhances aviation safety performance			.710		
Your staff are in satisfaction with the existing teamwork programs in meeting requirement for safety practices.			.684		
Effective communication and coordination among team members result in maintaining a high level of aviation safety performance?			.669		
The team work at Your Airline promotes a safety-focused mindset among all employees			.655		
Your Airline demonstrates a strong commitment to emergency preparedness and response following CRM principles				.781	
The frequency of safety incidents and accidents has decreased since the implementation of Crew Resource Management (CRM) at Your Airline				.712	
Your Airline has effective processes in place to ensure compliance with aviation safety regulations				.638	

The crew members at Your Airline demonstrate a strong commitment to complying with aviation safety regulations and guidelines				.633	
Your Airline conducts regular drills and exercises to test and enhance crew members' emergency preparedness following CRM training				.615	
The CRM training at Your Airline has improved my communication skills within the flight crew					.812
The CRM training has positively influenced my ability to communicate and coordinate with other crew members during critical phases of flight					.784
The CRM training has influenced my decision-making process when faced with safety-related challenges during flights					.664
I can recall instances where the CRM training positively impacted my decision-making and led to improved aviation safety performance.					.721
Insights and lessons learned from CRM training and exercises are utilized to enhance safety practices and prevent potential incidents					.681

Correlation Analysis

Correlations

		ASP	CT	EM	CC	TW
ASP	Pearson Correlation	1	.208**	.209**	.195**	.210**
	Sig. (2-tailed)		.002	.002	.003	.002
	N	223	223	223	223	223
CT	Pearson Correlation	.208**	1	.425**	.130	.108
	Sig. (2-tailed)	.002		.000	.053	.107
	N	223	223	223	223	223
EM	Pearson Correlation	.209**	.425**	1	.530**	.118
	Sig. (2-tailed)	.002	.000		.000	.079
	N	223	223	223	223	223
CC	Pearson Correlation	.195**	.130	.530**	1	.218**
	Sig. (2-tailed)	.003	.053	.000		.001
	N	223	223	223	223	223
TW	Pearson Correlation	.210**	.108	.118	.218**	1
	Sig. (2-tailed)	.002	.107	.079	.001	
	N	223	223	223	223	223

**. Correlation is significant at the 0.01 level (2-tailed).

Regression Analysis

Model Summary[b]

					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.316[a]	.100	.083	.51154	.100	6.053	4	218	.000

a. Predictors: (Constant), TW, CT, CC, EM

b. Dependent Variable: ASP

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6.336	4	1.584	6.053	.000[b]
	Residual	57.046	218	.262		
	Total	63.381	222			

a. Dependent Variable: ASP

b. Predictors: (Constant), TW, CT, CC, EM

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.522	.443		5.695	.000
	CT	.140	.069	.145	2.023	.044
	EM	.078	.087	.075	.891	.374
	CC	.108	.083	.101	1.300	.195
	TW	.158	.064	.164	2.475	.014

a. Dependent Variable: ASP

Appendix III: Plagiarism Similarity Index

EFFECTS OF CREW RESOURCE MANAGEMENT PRACTICES ON AVIATION SAFETY PERFORMANCE: A CASE OF LOW-COST CARRIER AIRLINES IN KENYA

by Jared Ngare

Submission date: 24-Oct-2023 10:15AM (UTC+0300)
Submission ID: 1651401090
File name: EFFECTS_OF_CREW_RESOURCE_MANAGEMENT_PRACTICES_FINAL_1.docx (404.02K)
Word count: 24432
Character count: 145866

EFFECTS OF CREW RESOURCE MANAGEMENT PRACTICES ON AVIATION SAFETY PERFORMANCE: A CASE OF LOW-COST CARRIER AIRLINES IN KENYA

ORIGINALITY REPORT

20%	18%	5%	9%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	ir.mu.ac.ke:8080 Internet Source	6%
2	ir.jkuat.ac.ke Internet Source	1%
3	erepository.uonbi.ac.ke Internet Source	1%
4	Submitted to Kenyatta University Student Paper	1%
5	Submitted to Kisii University Student Paper	<1%
6	Submitted to Mount Kenya University Student Paper	<1%
7	worldwidescience.org Internet Source	<1%
8	dspace.knust.edu.gh Internet Source	<1%

repository.mua.ac.ke