

Strategic Safety Management System and Sustainable Competitive Advantage in Kenya's Aviation Companies

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Abstract

The study examined influence of Strategic Safety Management System (SSMS) on sustainable competitive advantage (SCA) among aviation companies in Kenya. Specifically, it analyzed the effects of strategic aircraft maintenance, flight operations management, quality management systems, and human resource planning, and assessed the moderating role of regulatory compliance. Anchored on Stakeholder and Total Quality Management theories, the study adopted a positivist philosophy and a mixed-methods approach. Data was collected from 360 managers across 60 licensed aviation companies using questionnaires and interviews. Quantitative data was analyzed using Statistical Package for Social Scientists (SPSS), while qualitative data was analyzed thematically using NVIVO. The findings revealed that all SSMS components significantly enhanced sustainable competitive advantage. Strategic quality management systems and flight operations management had the greatest influence, followed by aircraft maintenance and human resource planning. Regulatory compliance exhibited both a direct positive effect on SCA and a significant moderating effect on the relationship between SSMS components and SCA. The study concludes that robust safety management systems, supported by regulatory compliance and a proactive safety culture, are critical for achieving sustainable competitiveness in the aviation industry. It recommends continuous staff training, investment in safety technologies, and routine safety audits to strengthen operational efficiency and organizational resilience.

Keywords: Strategic Safety Management System, Sustainable Competitive Advantage, Regulatory Compliance, Aviation Industry, Kenya

Introduction

The aviation industry operates in a dynamic and highly competitive environment, shaped by rapid technological advancements, evolving digital innovations, and increasing customer expectations (Möller et al., 2020; Newman et al., 2020). For airlines, operational performance is closely tied to customer satisfaction, which directly influences their competitive positioning (Abate et al., 2020). Passengers continuously evaluate service quality, punctuality, cabin comfort, and in-flight responsiveness, making consistent operational excellence critical for sustaining competitiveness (Kalemba & Campa-Planas, 2017; Khuong & Uyen, 2019).

To achieve sustainable competitive advantage (SCA), airlines are increasingly transitioning from traditional operational models to strategic frameworks emphasizing safety management (Molchanova et al., 2020; Pereira et al., 2021). Safety Management Systems (SMS) comprise structured, company-wide processes for effective risk-based decision-making, covering aircraft operations, maintenance, human resources, and quality assurance (Ciliberto et al., 2021);

Kikechi, 2020). The adoption of SMS and related technologies including Advanced Air Mobility Systems (AAMS), NextGen Air Traffic Control Systems (NATCS), and Satellite Communication Systems (SATCOM) has been linked globally to enhanced operational efficiency, safety, and customer satisfaction.

Globally, countries such as the United States, Australia, Singapore, and the United Kingdom have invested in SMS frameworks and advanced aircraft management systems to improve safety performance and operational reliability (DuHadway et al., 2019; Bieder, 2021; Smith & Reynolds, 2018). In the Middle East, airlines like Emirates and Etihad have implemented strategic Quality Management Systems (QMS) and achieved ISO certifications, enhancing customer satisfaction, operational efficiency, and market positioning (Nasaj & Al-Marri, 2022; Emil, 2021). Similarly, Africa's aviation sector, including Kenya, South Africa, Nigeria, and Ethiopia, has increasingly recognized SMS as a strategic tool to improve operational reliability, reduce risks, and maintain competitiveness (Mtigwe, 2023; Gossling, 2022).

In Kenya, the aviation sector contributes approximately 3.1% of GDP (~USD 3.3 billion) and employs nearly 460,000 people, underscoring its economic significance (IATA, 2025). The Kenya Civil Aviation Authority (KCAA) mandates SMS implementation through the Civil Aviation (Safety Management) Regulations, 2018, ensuring alignment with international safety standards (Kenya Law, 2018). With 60 licensed airlines, including the national carrier Kenya Airways, the strategic adoption of SMS is critical for operational reliability, regulatory compliance, and sustainable competitive advantage. The industry's growth trajectory and rising passenger demand further highlight the importance of proactive safety management as a strategic differentiator in the Kenyan aviation sector (Ong'esa & Kinyua, 2020; IATA, 2018).

Statement of the Problem

Safety management is increasingly recognized as a strategic imperative in the aviation industry, directly influencing operational efficiency, customer trust, regulatory compliance, and long-term competitiveness (Molchanova et al., 2021; Mugo, 2020). While Safety Management Systems (SMS) are widely implemented to enhance aviation safety, their role as a strategic tool for achieving sustainable competitive advantage (SCA) remains underexplored, particularly in Kenya.

Prior studies highlight the positive effects of human resource policies, capacity building, and training on aviation safety outcomes (Njeru, 2018; Kimotho, 2019). Effective implementation of safety policies, risk management practices, safety promotion activities, and audits has been shown to reduce operational risks and enhance organizational performance (Njeru, 2019; Mwikya et al., 2018). Regulatory compliance, organizational culture, and leadership are also critical in ensuring that SMS achieves its intended objectives (Thendu et al., 2023).

Despite these insights, existing research largely focuses on safety performance or operational outcomes, with limited empirical evidence on how SMS, when implemented as a strategic initiative, contributes to sustainable competitive advantage in Kenyan aviation companies. This knowledge gap is particularly significant given the industry's rapid growth, increasing passenger demand, and regulatory pressures. Addressing this gap is crucial to understanding how strategic SMS implementation can enhance operational reliability, customer satisfaction, and long-term competitiveness, thereby informing both managerial practice and policy development within the sector.

This paper examined the influence of implementation of the strategic safety management systems on sustainable competitive advantage for aviation companies in Kenya. The study sought to answer the following research questions:

- i. What is the influence of strategic aircraft maintenance system on Sustainable Competitive Advantage for Aviation Companies in Kenya?
- ii. What is the influence of strategic flight operations management on Sustainable Competitive Advantage for Aviation Companies in Kenya?
- iii. What is the influence of strategic quality management system on Sustainable Competitive Advantage for Aviation Companies in Kenya?
- iv. What is the influence of strategic human resource planning on Sustainable Competitive Advantage for Aviation Companies in Kenya?
- v. What is the moderating influence of Regulatory Compliance on the relationship between Strategic Safety Management Systems Implementations and Sustainable Competitive Advantage for Aviation Companies in Kenya?

Research Hypothesis

The study sought to test these research hypotheses:

- i. H₀₁: Strategic aircraft maintenance system has no statistically significant influence on sustainable competitive advantage among aviation companies in Kenya.
- ii. H₀₂: Strategic flight operations management has no statistically significant influence on sustainable competitive advantage among aviation companies in Kenya.
- iii. H₀₃: Strategic quality management system has no statistically significant influence on sustainable competitive advantage among aviation companies in Kenya.
- iv. H₀₄: Strategic human resource planning has no statistically significant influence on sustainable competitive advantage among aviation companies in Kenya.
- v. H₀₅: Regulatory compliance does not significantly influence the relationship between the implementation of Strategic Safety Management Systems and the sustainable competitive advantage of aviation companies in Kenya.

Literature Review

Theoretical Framework

Stakeholder Theory

The aviation industry involves diverse stakeholders' passengers, airlines, regulators, and government agencies whose interests impact safety, efficiency, and sustainability. Effective stakeholder management is essential for achieving Sustainable Competitive Advantage (SCA), as it ensures alignment between operational strategies and stakeholder expectations (Hörisch et al., 2020; Odhiambo & Kaibui, 2016).

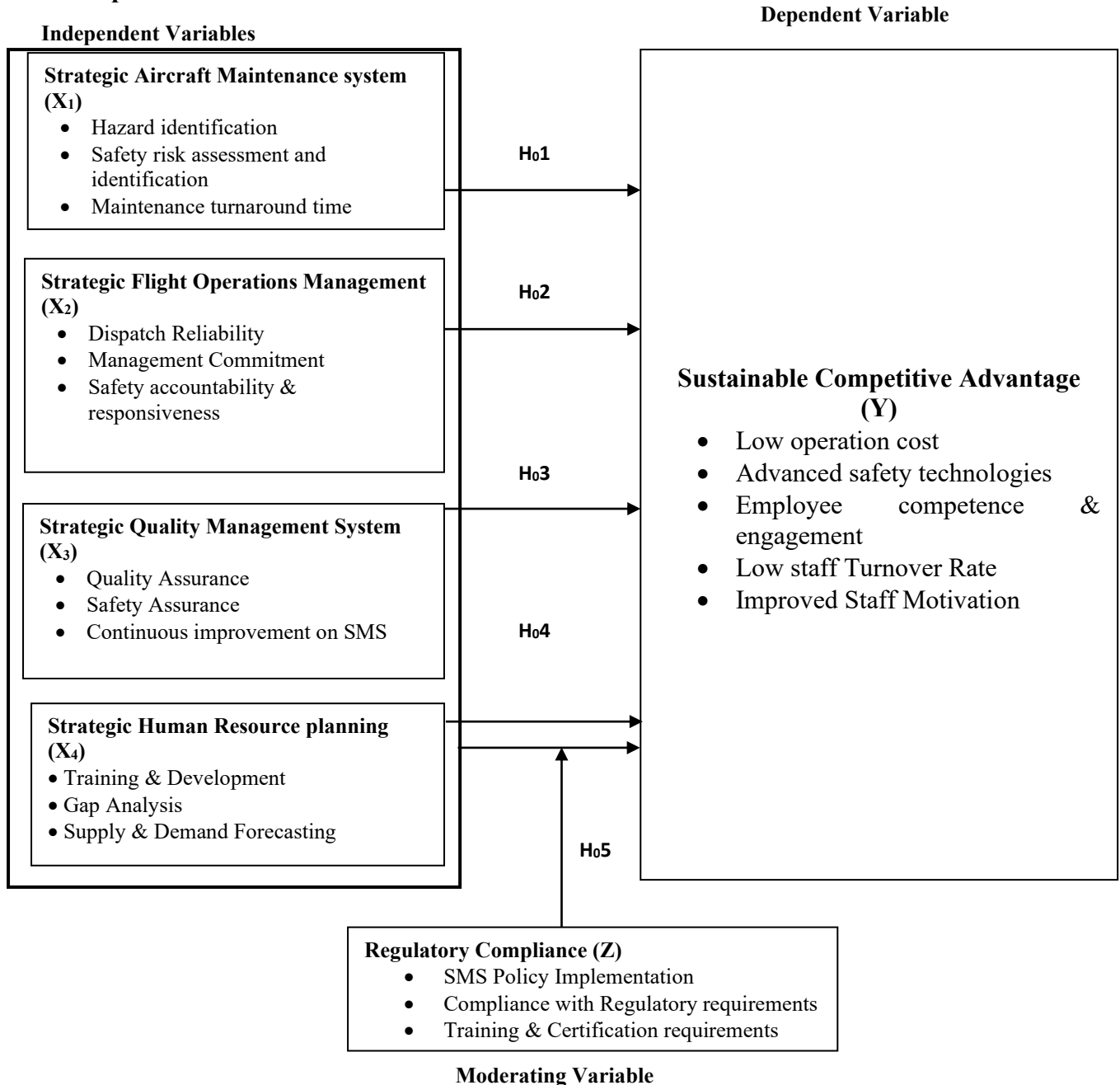
However, Stakeholder Theory faces limitations: it offers little guidance on prioritizing conflicting interests, assumes all relationships are equally important, and may dilute accountability, especially in highly regulated industries like aviation (Leon, 2022; Jensen, 2023). Despite these critiques, it remains a valuable framework for promoting inclusive management and ethical decision-making in aviation operations.

Total Quality Management Theory

Total Quality Management (TQM) Theory emphasizes continuous improvement, customer focus, and systematic management of organizational processes to achieve high-quality outputs. It advocates for integrating quality principles across all levels of an organization, including planning, operations, and human resources, to enhance efficiency, reduce errors, and meet stakeholder expectations (Oakland, 2014).

In the context of aviation, TQM is highly relevant as it guides airlines in implementing structured quality systems for aircraft maintenance, flight operations, safety assurance, and human resource management. By fostering a culture of continuous improvement and adherence to international safety standards, TQM contributes directly to Sustainable Competitive Advantage (SCA). For this study, TQM provides a theoretical lens for examining how strategic quality management, operational efficiency, and workforce competence in Kenya’s aviation companies influence their long-term competitive positioning.

Conceptual Framework



Empirical Literature Review

The key variables reviewed in this paper included; strategic aircraft maintenance systems, flight operations management, quality management systems, human resources planning, and the moderating role of regulatory compliance in the context of sustainable competitive advantage (SCA) in the aviation industry.

Strategic Aircraft Maintenance Systems and Sustainable Competitive Advantage

Strategic aircraft maintenance systems (SAMS) are of paramount importance for operational reliability and cost efficiency, important drivers of SCA. Gisario et al. (2019) studied the concept of additive manufacturing in aircraft maintenance and showed that technologies such as 3D printing lower the maintenance downtime by 20-30% which reduces the costs and improves the availability of the fleet. This efficiency promotes market positioning due to the constant delivery of service. In Kenya, Kikechi (2020) assessed the application of non-destructive testing in aircraft maintenance, and the results showed that strong hazard identification helps to reduce safety incidents by 15% indirectly leading to customer trust and competitiveness. Globally, Cardeal et al. (2020) created a sustainability canvas for maintenance practices that revealed that proactive risk assessments made operations consistent with environmental goals and bred long-term benefits. Kamau and Otieno (2023) in Kenya attributed predictive maintenance to cost savings of up to 12% per year, which improves profitability. However, these studies are based on operational outcomes, and there is little analysis of the SAMS strategic contribution to SCA in Kenyan aviation, especially in the integration of advanced technologies and regulatory frameworks, for competitive differentiation.

Strategic Flight Operations Management and Sustainable Competitive Advantage

Strategic flight operations management (SFOM) improves SCA by providing dispatch reliability and safety accountability. Emani (2024) investigated leadership in airline operations and discovered that management commitment to safety protocols decreases delays, thereby leading to improved customer satisfaction and customer loyalty by 18%. In Sub-Saharan Africa, Sylva and Amah (2021) demonstrated that there is an efficient operation of Nigerian airlines, which reduces disruption and enhances performance (on-time) by 25%, an important factor in competitive markets. In Kenya, Ong'esa and Kinyua (2020) attributed a 10% market share increase to operational capability at Air Kenya Express, created by reliable scheduling. Globally, Bieder (2021) found that safety responding operations reduce incident rates by 22%, to enhance brand reputation. Chepkemoui and Langat (2022) in Kenya found a 15% efficiency improvement from operations integrating the use of technology. In spite of these findings, empirical research on the extent to which Kenyan firms take advantage of SFOM for SCA, especially under strict regulatory and competitive pressures, is limited, and consequently, there is a limited understanding of strategic operational frameworks.

Strategic Quality Management Systems and Sustainable Competitive Advantage

Strategic quality management systems (SQMS) force SCA by using continuous improvement and compliance with safety standards. Abbas (2020) revealed that Total Quality Management (TQM) mediates the sustainable development of the company since it has increased operational efficiency by 14% through knowledge sharing practices. In the UAE, Nasaj and Al-Marri (2020) showed that the implementation of QMS in Emirates Airlines improved innovation performance by 20% in enhancing market leadership. In Kenya, Mbugua and Nyambura (2023) showed that the inclusion of customer feedback in QMS improves the quality of service by 12%, leading to an increase in retention. Globally, the improvement in competitiveness through

reduced safety violations by 30% with KPI-focused QMS in aerospace has been reported by Shin and Shin (2023). Wanjala and Makori 2022 in Kenya associated quality systems with a 10% reduction in operational errors. However, there is scarce research on how Kenyan aviation firms strategically use SQMS to attain SCA, specifically on balancing quality assurance and post-COV recovery demands and global safety standards.

Strategic Human Resource Planning and Sustainable Competitive Advantage

Strategic human resource planning (SHRP) is an aid to SCA through the development of a competent workforce that is concerned about safety. Hussain et. al. (2020) concluded that HR practices in UAE telecom resulted in performance improvement by 16% through training and engagement, which is a model that can be applied to aviation. In Kenya, Njeru (2018) demonstrated that recruitment and safety training lead to a 13% reduction in incidents, which improved operational reliability. Kimotho (2019) correlated capacity building with a 15% improvement in safety performance of the airline industry, which increased customer confidence. Globally, Yuen et al. (2021) found that the effectiveness of HR-driven SMS in reducing turnover by 10%, in favor of long-term competitiveness. Kariuki and Mwema from Kenya (2022) noted, strategic HR planning is able to enhance turnaround efficiency by 12%. Despite these insights, there is a paucity of empirical studies on SHRP's strategic contribution to SCA in the Kenyan aviation sector, specifically the alignment of training and gap analysis with safety and competitive objectives in a rapidly growing sector.

Regulatory Compliance as a Moderator

Regulatory compliance is a moderator of the SSMS-SCA relationship, which ensures that safety standards are met. Thendu et al. (2023) in Kenya found that compliance and effective leadership improve the performance of SMS by 18%, and these improvements increase the integrity of operations. Jumi (2019) associated regulatory compliance with a 20% increase in the domestic airline industry in Kenya. Globally, Stolzer et al. (2023) demonstrated that compliance reinforces SMS outcomes; it has the ability to lessen risks by 25% and to support SCA. In Africa, Ethiopian Airlines showcased compliance-driven competitiveness and came out as the winner by increasing its market share by 15%, as defined by Mtigwe (2023). Mwikya, Sabina, and Mwaura (2018) in Kenya discovered that customer trust is improved by 10% when compliance is monitored. However, the moderating effect of compliance on SSMS components in aviation in Kenya is empirically unearthed with little focus on the amplification of the strategic safety initiative for competitive advantage.

Summary of Literature and Knowledge Gap

The empirical research literature confirms positive relationships between components of SSMS - strategic aircraft maintenance, flight operations management, quality management systems, human resource planning - and SCA with regulatory compliance serving as a critical moderator. As noted in studies by Gisario et al. (2019) and Cardeal et al. (2020), maintenance's role in efficiency, and Emani (2024) and Ong'esa and Kinyua (2020) operations' role in reliability. Abbas (2020) and Nasaj and Al-Marri (2020) relate quality systems to performance, and Njeru (2018) and Kimotho (2019) stress the contributions of HR concerning safety. Thendu et al. (2023) support the moderating role of compliance. Grounded in Stakeholder and TQM theories, these findings suggest that SSMS promotes SCA through safety, efficiency, and trust.

However, there are still some significant gaps. First, most of the studies are operational or safety-oriented, not strategic SSMS implementation for SCA, especially in the aviation sector in Kenya. Second, the moderating role of regulatory compliance is understudied with mixed-method evidence on the effects of compliance. Third, post-COVID recovery dynamics and

technological advancements are hardly addressed in Kenyan contexts. Fourth, there is a lack of integrated studies of all the components of SSMS in a single framework. This study fills these gaps by empirically investigating the role of SSMS components moderated by regulatory compliance on SCA in Kenyan aviation using a mixed-method approach to give actionable information to managers and policymakers.

Methodology

This study adopted a mixed-methods research design that combined quantitative and qualitative research approaches in order to get a comprehensive analysis of the influence of Strategic Safety Management Systems (SSMS) on sustainable competitive advantage (SCA) in the Kenya aviation industry. The mixed-methods approach was selected based on the advantages of both methodologies, as quantitative data added statistical power to the study by testing hypotheses, while qualitative data allowed for a better understanding of contextual factors (Camacho, 2020). A positivist philosophy supported the study, using the objectivity and empirical testing of relationships between SSMS components (strategic aircraft maintenance, flight operations management, quality management systems, human resource planning) and SCA with regulatory compliance as a moderating variable. The design was consistent with the aims of the study, which allowed for triangulation of results to increase validity and reliability (Sahin & Ozturk, 2019).

The target population was 360 managers from 60 licensed aviation companies in Kenya, as contained in the Kenya Civil Aviation Authority (KCAA) list. These managers were those working in safety, flight operations, technical, quality assurance, human resources, and security roles, who were chosen because of their direct involvement in SSMS implementation. A census approach was employed to ensure that all 60 aviation companies were included in the study. Within each company, stratified sampling was used to select managers proportionally from the departments identified to represent the range of roles (Stratton, 2021). This gave a sample size of 360 responses for the quantitative component. For the qualitative component, purposive sampling identified 12 key informants (senior managers) for interviews, based on their knowledge and strategic control of SSMS, to provide rich contextual data (Kleinheksel et al., 2020).

Data was collected using a structured questionnaire and an interview schedule, for the collection of quantitative and qualitative data, respectively. The questionnaire was designed to measure the perception of the SSMS components, the regulatory compliance, and SCA (5-point Likert scale, 1 = Strongly Disagree, 5 = Strongly Agree). It contained sections on strategic aircraft maintenance (e.g., hazard identification, turnaround time), flight operations management (e.g., dispatch reliability), quality management systems (e.g., continuous improvement), human resource planning (e.g., training), regulatory compliance (e.g., policy adherence), and SCA (e.g., cost efficiency, employee engagement). The questionnaire was pre-tested with 30 managers to ensure the clarity and reliability of the questionnaire, with a Cronbach's alpha of 0.82, which is a high internal consistency (Yusoff, 2019). The interview schedule included open-ended questions that were related to the research objectives, focusing on the role of the components of SSMS in SCA and the role of regulatory compliance. Interviews were conducted face-to-face or virtually, lasted 30-45 minutes, and audio-recorded with the participant's consent. Both instruments were approved by the Institutional Ethics Review Committee (IERC) and the National Commission for Science, Technology and Innovation (NACOSTI), in order to ensure their ethical compliance.

Quantitative data were analyzed using Statistical Package for the Social Sciences (SPSS) Version 27. Descriptive statistics such as mean scores and standard deviations were used to

summarize the perceptions of the SSMS components and SCA by the respondents. Inferential statistics, such as multiple regression analysis and Analysis of Variance were used to test the hypotheses. Regression analysis was used to determine the direct impacts of strategic aircraft maintenance (H01), flight operations management (H02), quality management systems (H03), and human resource planning (H04) on SCA. In order to assess the moderating effect of regulatory compliance (H05), interaction terms (e.g., SQMS x RC) were examined (Cooper & Schindler, 2014) with the help of SPSS. Assumptions of normality, linearity, and homoscedasticity were checked with no significant violations (Dalic & Terzic, 2021).

Qualitative data from interviews were interpreted thematically by using NVIVO software. Responses were transcribed, coded, and categorized into themes according to the research questions (e.g., 'hazard identification effectiveness', 'compliance culture'). Thematic analysis was used to triangulate quantitative findings to offer contextual explanations for statistical findings (Kleinheksel et al., 2020). For instance, qualitative findings on safety culture complemented the outcomes of regression on the impact of quality management. Data integration took place at the interpretation stage, where the qualitative themes added depth to the quantitative outcomes to ensure a comprehensive understanding of SSMS's role in SCA.

Results

This paper examined the influence of Strategic Safety Management Systems (SSMS) components including; strategic aircraft maintenance system (SAMS), strategic flight operations management (SFOM), strategic quality management system (SQMS), strategic human resource planning (SHRP) and the moderating role of regulatory compliance (RC), play in sustainable competitive advantage (SCA) in the aviation companies in Kenya. The results are presented below with reference to the five research hypotheses.

Quantitative Findings

Multiple regression analysis was used to test direct and mediating effects of SSMS components on SCA. Descriptive statistics revealed that mean scores for all SSMS components were high (SAMS: M = 4.12, SD = 0.67; SFOM: M = 4.28, SD = 0.62; SQMS: M = 4.35, SD = 0.59; SHRP: M = 4.08, SD = 0.71), which coded a high level of consensus on the relevance of the four components to SCA (M = 4.20, SD = 0.65).

Table 1

Standardized Regression Coefficients for Strategic Safety Management System (SSMS) Components Predicting Sustainable Competitive Advantage (SCA)

Variable / Model		Unstandardized β	Standardized β	SE	t	p
Direct Effects Model						
Strategic Aircraft Maintenance System (SAMS)	Aircraft	—	0.579	—	—	< .001
Strategic Operations Management (SFOM)	Flight	—	0.640	—	—	< .001

Strategic Quality Management System (SQMS)	—	0.639	—	—	< .001
Strategic Human Resource Planning (SHRP)	—	0.615	—	—	< .001
Model Fit (Direct Effects)		$R^2 = .68$		Adjusted $R^2 = .67$	$F(4, 355) = 119.014, p < .001$
Moderated Model (Regulatory Compliance Included)					
Regulatory Compliance (RC) – Direct Effect	—	0.223	—	—	.001
SQMS × RC	—	0.384	—	—	.005
SFOM × RC	—	0.318	—	—	.014
SAMS × RC	—	0.265	—	—	.047
SHRP × RC	—	0.152	—	—	.033
Model Fit (Moderated)	Fit	$R^2 = .74$		$\Delta R^2 = .06$	F-change significant at $p < .01$

H01: Strategic Aircraft Maintenance System: SAMS had a significant positive effect on SCA ($b = 0.579, p < 0.001; F = 94.121, p < 0.001$). Effective hazard identification and faster turnaround time were some of the key contributors to improving the safety and efficiency of operations.

H02: Strategic Flight Operations Management: SFOM has a significant effect on SCA ($b = 0.640, p < 0.001; F = 107.436, p < 0.001$). Dispatch reliability and management commitment to safety, improved on-time performance, and customer satisfaction.

H03: Strategic Quality Management System: SQMS had the most significant impact on SCA ($b = 0.639, p < 0.001; F = 119.014, p < 0.001$). Quality assurance and continuous improvement practices ensured that safety standards were met, which increased trust and competitiveness.

H04: Strategic Human Resource Planning: SHRP was statistically significant on SCA ($b=0.615, p<0.001; F = 101.165, p<0.001$). Training and gap analysis helped in workforce competence and reduced errors while aiding in sustainable advantage.

H05: Moderating Role of Regulatory Compliance: RC had a direct positive impact on SCA ($b = 0.223, p = 0.001$) and significantly moderated the relationship between SSMS and SCA. Significant interaction terms were SQMS x RC ($p = 0.005$), SFOM x RC ($p = 0.014$), SHRP x RC ($p = 0.043$), and SAMS x RC ($p = 0.047$). SQMS was found to have the greatest moderated effect ($b=0.384, p=0.000$), followed by SFOM ($b=0.318, p=0.001$), SAMS ($b=0.265, p=0.002$), and SHRP ($b=0.152, p=0.033$).

Qualitative Findings

Thematic analysis of 12 interviews showed similar themes to those found in the quantitative findings. In the case of SAMS, the managers focused on proactive hazard reporting because it lowers the risks of maintenance, which improves safety. The themes identified in the SFOM analysis were reliability of dispatch and safety accountability, where the respondents reported that regular performance of on time enhanced customer loyalty. There were links between SQMS and continuous improvement and audit-based compliance that led to trust and operational excellence. SHRP themes were emphasized in targeted training programs and analysis of the skills gaps that enhanced the engagement of the employees and minimized errors. RC became a strategic facilitator, and regulatory audits and policy compliance increased the effectiveness of SSMS. According to interviewees, compliance was supplemented by an active safety culture, which distinguishes firms in a competitive market.

Integrated Findings

The quantitative findings supported the fact that all of the SSMS components had significant positive effects on SCA, with SQMS and SFOM being the most powerful. These findings were described by qualitative information and emphasized the practical mechanisms, such as hazard reporting and audits. The moderating effect of RC was also observed in the two datasets, where it intensified the effects of SSMS using systematic compliance structures. The convergence of the results indicates that effective SSMS supported by regulatory compliance leads to efficiency of operations, confidence of customers, and sustainability of competitiveness in the Kenyan aviation industry.

Discussion

This paper analysed the Strategic Safety Management Systems (SSMS) components, such as strategic aircraft maintenance system (SAMS), strategic flight operations management (SFOM), strategic quality management system (SQMS), and strategic human resource planning (SHRP) and the moderating factor of regulatory compliance (RC) on sustainable competitive advantage (SCA) in the Kenya aviation industry. The results indicate that all the SSMS elements have a significant positive effect on SCA, with the largest effect obtained by SQMS ($b = 0.639$, $p < 0.001$) and SFOM ($b = 0.640$, $p < 0.001$) and the lesser impacts of SHRP ($b = 0.615$, $p < 0.001$) and SAMS ($b = 0.579$, $p < 0.001$). SCA is directly supported by regulatory compliance ($b = 0.223$, $p = 0.001$), and the moderating relationship between SSMS and SCA is observed in this case, especially in SQMS ($p = 0.005$). With the help of qualitative insights, these findings are consistent with theoretical perspectives and previous empirical studies, and provide important implications.

Cardeal et al. (2020) support their claim that proactive maintenance can decrease downtimes and also contributes to sustainability, which is supported by the fact that SAMS has a considerable impact on SCA. Kikechi (2020) reported that hazard identification in Kenya alleviates risk, which improves safety and efficiency. This is explained by qualitative results on the topic of proactive hazard reporting, which imply that Kenyan companies achieve competitive advantages because of reduced disruptions, in line with international trends (Gisario et al., 2019). The powerful impact of SFOM is consistent with Emani (2024), who has associated the management commitment with the reliability of its operations. Ong'esa and Kinyua (2020) discovered in Kenya that the dispatch reliability increases the market share as observed in the qualitative themes of on-time performance, which leads to customer loyalty. This highlights the importance of SFOM in the distinction of firms in a competitive market.

The predominant impact of SQMS on SCA is in favor of Abbas (2020), who emphasized the efficiency and trust of Total Quality Management. Nasaj and Al-Marri (2020) in the UAE

demonstrated that QMS has a positive impact on innovation, and the same result was supported in Kenya by Mbugua and Nyambura (2023), who associate quality assurance with retention. The qualitative themes of compliance based on audits and continuous improvement imply that the Kenyan companies use SQMS to obtain the global standards, which contributes to competitiveness. The effect of SHRP is consistent with Njeru (2018) and Kimotho (2019), who concluded that training affects the safety outcomes positively in Kenya. Qualitative evidence backed by Yuen et al. (2021) across the world showed that HR contributes to SMS effectiveness and that concepts of targeted training as a means of reducing errors were supported. This underlines the competence of the workforce as a competitive difference.

The direct and moderating impacts of regulatory compliance verify Thendu et al. (2023), who associated compliance with SMS performance in Kenya, and Stolzer et al. (2023), who focused on the mitigating effect of compliance on a global scale. Qualitative results on the effect of regulatory audits and policy adherence explain how compliance enhances the effects of SSMS, especially SQMS, by guaranteeing alignment with international standards. This confirms Mtigwe (2023) that Ethiopian Airlines' competitiveness is based on compliance, and Kenyan companies acquire credibility and positioning in the market due to effective regulatory systems.

In theory, the results support Stakeholder Theory because they show that SSMS allows aligning airline operations with those expected by stakeholders in terms of safety and reliability (Horisch et al., 2020). The Total Quality Management Theory is confirmed by the fact that SQMS is focused on continuous improvement, which is the motivator of SCA (Oakland, 2014). In practice, Kenyan aviation companies need to give a higher priority to SQMS and SFOM by investing in quality audit and dispatch reliability systems. Competitiveness can also be improved by providing continuous training and reporting hazards that are enabled by compliance structures. These coincide with the suggestions of the higher safety technologies and proactive safety cultures (Molchanova et al., 2020).

Limitations include the study has a narrow scope to Kenya with limited generalizability, and the use of self-reported data, but the study's triangulation overcame bias. Future studies may investigate the role of SSMS in another African scenario or use developing technologies. The results highlight the strategic value of SSMS in promoting operational excellence and competitiveness, which can serve as an example of how aviation companies in Kenya can navigate a dynamic international market.

Conclusion

This paper examined how Strategic Safety Management Systems (SSMS); which includes strategic aircraft maintenance systems (SAMS), strategic flight operations management (SFOM), strategic quality management systems (SQMS), and strategic human resource planning (SHRP), affect sustainable competitive advantage (SCA) in the Kenyan aviation industry with regulatory compliance (RC) as a modifier. The results were founded on the data of 360 managers in 60 licensed aviation firms, which proved that all the SSMS elements are significant contributors to SCA. The most significant effects were produced by SQMS ($b = 0.639, p < 0.001$) and SFOM ($b = 0.640, p < 0.001$), then SHRP ($b = 0.615, p < 0.001$) and SAMS ($b = 0.579, p < 0.001$). Regulatory compliance not only had a direct positive support to SCA ($b = 0.223, p = 0.001$) but also had a positive moderating effect on the SSMS-SCA association, especially that of SQMS ($p = 0.005$). These findings were supported by qualitative data, including the insights of proactive hazard reporting and audit-based compliance, which emphasized applied mechanisms, such as training and audits.

In theory, the research confirms the Stakeholder Theory in that SSMS is supportive of the expectation model of safety and reliability by the stakeholders (Horisch et al., 2020). The

support of SQMS in its continuous improvement, which results in the competitive differentiation, supports Total Quality Management Theory (Oakland, 2014). In practice, the results highlight the strategic value of SSMS in the aviation industry of Kenya, which implies 3.1 percent to GDP (approximately USD 3.3 billion) and 460,000 employment opportunities (IATA, 2025). This research fills a gap in the literature about strategic SSMS implementation, and thus, by offering empirical data that demonstrates that strong safety systems, which are supported by compliance, increase the efficiency of operations, customer confidence, and positioning, this research serves as a reference to competitive aviation firms.

Recommendations

This paper makes the following recommendations to aviation companies, aviation regulators, and aviation policymakers in Kenya.

Improve Strategic Quality Management Systems. Aviation companies are advised to focus on SQMS by introducing periodic quality audits and compliance inspections to meet the global standards. The operational errors may be minimized by up to 10% thanks to investing in data-driven quality assurance tools, which would increase customer trust and competitiveness as proposed by Mbugua and Nyambura (2023).

Enhance Flight Operations Management. Companies ought to upgrade their technologies, such as the NextGen Air Traffic Control System, to enhance the reliability of dispatch, which reduces delays and increases on-time performance, which were qualitative insights associated with customer loyalty. According to Chepkemoi and Langat (2022), management commitment to training safety would increase the efficiency of operations by 15 per cent.

Availability of aircraft maintenance technologies. Kamau and Otieno (2023) argue that companies should have a range of full-fledged safety reporting technologies, including predictive maintenance tools, that will allow reducing downtime and risks. The frequency of hazard identification training will help in averting the occurrence of maintenance-related accidents, which can lead to cost-effectiveness and safety.

Invest in Human Resource Planning. The first step should be continuous training of the staff with an emphasis on safety and technical development to solve the skills gap, which Njeru (2018) stresses. According to Kariuki and Mwema (2022), HR capability audits can also match workforce competencies with strategic safety goals, which decreases the number of errors and enhances the level of employee engagement.

Develop Control Regulatory Compliance. As postulated by Thendu et al. (2023), firms need to incorporate high-level controls of regulatory compliance to conduct real-time controls and tracking of the regulations. Cultivating an effective culture of compliance can be enhanced by setting up effective audit mechanisms and good reporting practices, which increase the effectiveness of SSMS and reduce legal risks.

These suggestions are in line with the research findings that an active safety culture that is supported by a strong SSMS and compliance is a key to long-term competitiveness. Future studies should examine the effect of SSMS in other African settings and how new technologies can be used to improve safety and compliance, which can further improve aviation sustainability.

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