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Examining the Influence of Adoptability, Alignment, and Agility Approaches on the Sustainable Performance of Aviation Industry: An Empirical Investigation of Supply Chain Perspective

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The aviation sector is the backbone of global connectivity, and advancement in environmental, social, economic, and technological development is currently this sector's dynamic challenge. In this regard, aviation companies' long-term survival now depends critically on their capacity to adapt quickly to change, match their objectives with sustainability, and demonstrate agility (Saydumarov et al., 2023). The objective of this empirical study is to disentangle the complex interrelationships between the agility, alignment, and adaptability approaches, and their combined impact on the aviation sector's sustainable performance (Feizabadi et al., 2021).

In the past, the aviation industry has been crucial in influencing international trade, travel, and technological advancement. But by its very nature, it is vulnerable to a wide range of external influences, such as disruptive technological breakthroughs, environmental concerns, and swings in the economy (Ding et al., 2024). With the aviation industry facing increased demands for environmental accountability and the need to promote sustainable practices, it is necessary for aviation-related companies to reevaluate their operational plans (Alzoubi et al., 2023).

As a core strategic component, adaptability deals with an organization's capacity to take in and incorporate new procedures and technologies into its operational frameworks. Because of the rapid advancements in aircraft technologies, navigation systems, and operating procedures, the aviation industry is known for its rapid acceptance and use of innovation (Undavalli et al., 2023). This study aims to ascertain the extent to which aviation firms may promote flexibility to facilitate the seamless integration of new technologies and enhance overall operational efficiency, all the while mitigating unfavorable environmental effects (Alharbi et al., 2022).

In the aviation industry agility and alignment are also identified as critical components for establishing the organizational strategy. The capability of an organization to coordinate its plans with social and environmental aspects is considered as alignment in this investigation (Ding et al., 2024). In contemporary world of business, sustainability becomes a hot topic, and the pressure is mounting on aviation organizations that they shall align their operations with values that prioritize social responsibility and environmental stewardship (Caesari et al., 2023; Wils et al., 2006). Under this study we analyzed the strategies and practices that enable strategic alignment in the aviation sector to realize how companies may support sustainability goals without endangering their financial stability.

Agility, or an organization's ability to respond swiftly and effectively to unforeseen challenges and changes in the external environment, is the third factor under examination (Baykal & Mizrak, 2019). To successfully navigate turbulent waters, the aviation industry needs its organizations to possess an extraordinarily high degree of adaptability due to its vulnerability to sudden changes in the world economy, legislative requirements, and international events (Baykal & Mizrak, 2019; Wils et al., 2006). This study investigates strategies that assist firms manage uncertainty while maintaining an eye on long-term results, as well as how agility is displayed in the aviation sector (Ding et al., 2024).

Therefore, this study has empirically investigated the intersection of technological innovation in the aviation business, environmental responsibility, and strategic resilience. The overall purpose of this study was to provide recommendations and support to enhance aviation organizations' long-term performance in a rapidly evolving global landscape. This study also contributes to the ongoing discussions on sustainable performance and sustainable practices, especially in the aviation context.

Literature Review

In the ever-evolving landscape of the aviation industry, the nexus between organizational strategy and sustainable performance has become increasingly vital. As aviation organizations grapple with the imperatives of adapting to emerging technologies, aligning with environmental and social considerations, and exhibiting agility in the face of unpredictable challenges, a comprehensive understanding of the existing literature is imperative. This literature review explored the current body of knowledge surrounding adaptability, alignment, and agility approaches within the aviation industry and their influence on sustainable performance. By synthesizing insights from diverse scholarly contributions, this review establishes a foundation for the empirical investigation into the intricate dynamics that govern the sustainable evolution of the aviation sector.

Aviation Industry

A vital component of global logistics and connectivity is the aviation industry and it has significant impact on the economic development (Eriksson & Steenhuis, 2015). Nowadays this aviation sector has undergone significant transformations which is driven by technological advancements, environmental concerns, and evolving consumer expectations (Singh et al.; Sun et al., 2020). Under this literature review we explored the key themes that have shaped the trajectory of the aviation sector and are emphasizing the intricate interplay between technological progress, environmental imperatives, and strategic resilience (Undavalli et al., 2023).

Technology has continuously impacted the aviation business and is known to be one of the main pillars supporting the aviation industry's expansion. This

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journey took start from the Wright brothers' groundbreaking flight to the current era of sophisticated aircraft design and state-of-the-art avionics (Ding et al., 2024). It is essential that for the improvement in the operational efficiency and safety, the aviation industry shall have a strong technological adoption strategy (Williams, 2019). In this regard the adaptability, or capacity of aviation industry's to adhere and quickly accept and incorporate new technology, has become a key concern for the aviation operations businesses and it is considered a crucial to stay ahead of the competition (Ding et al., 2024).

The second significant and essential pillar of the current discourse surrounding the aviation industry is environmental considerations. The aviation activities are contributing significantly to the environmental pollution and the current situation of increasing climate change concerns has abundant support to the growing need for sustainable practices (Singh et al., 2023). The major environmental effects comes through the noise and carbon emissions and pollution through air logistics (Karaman et al., 2018). This discussion has highlighted the responsibility of industries to address carbon emissions and noise pollution. Organizations are facing the challenge of aligning their operations with environmental considerations, incorporating eco-friendly practices, and investing in alternative fuels and propulsion systems to enhance sustainability (Undavalli et al., 2023).

Besides the technological and environmental factors, the aviation industry is also vulnerable to unforeseen challenges and external disruptions. The ability, flexibility, or the capacity of the organizations operations to respond the disasters or any unforeseen events or challenges is termed the “agility” and is crucial for the organizations resilience (Ding et al., 2024). Research by Pettit and Beresford (2019) underscored the importance of agility in navigating uncertainties, such as economic fluctuations, geopolitical events, and global health crises (Lim et al., 2019). The recent pandemic of COVID-19 has urged the significance of organizational agility in adapting to rapidly changing circumstances (Wils et al., 2006).

Furthermore, the dynamics of global competition, regulatory frameworks, and collaborative partnerships have shaped the aviation industry's strategic landscape. Scholars such as O'Connell and Williams (2019) emphasized the role of strategic alliances, mergers, and acquisitions in influencing the industry's competitive structure. The strategic decisions made by aviation organizations impact their overall performance and ability to align with global market trends.

The aviation sector is characterized by a high rate of advancement appropriation and execution due to the speedy changes in aircraft advances, navigation systems, and working forms. The objective of this study is to decide how much aviation organizations can do to cultivate adaptability so that modern innovation can be consistently coordinates and move forward generally for the operational effectiveness whereas lessening antagonistic natural impacts.

Sustainable Performance of Aviation Industry

Sustainable aviation operations management has emerged as a critical area of research in response to the growing climate change and environmental concerns and to fulfill the needs of the responsible business practices. Scholars have investigated various aspects of sustainability within the aviation sector, e.g., the challenges of sustainable aviation operations, opportunities, and strategies that organizations needs to employ to balance the environmental and social responsibility with economic viability (Sharma & Singh, 2017).

One key aspect of sustainable performance in aviation is the industry's environmental impact, particularly its contribution to carbon emissions and climate change. Researchers have emphasized the need for the aviation sector to address its carbon footprint and adopt measures to mitigate environmental harm (Ding et al., 2024; Gudmundsson et al., 2021). This sustainability means the vibrant investments in fuel-efficient aircraft, introducing the alternative efficient fuel fuels, and to extend the efforts to increase operational efficiency and to reduce emissions (Undavalli et al., 2023).

In this discussion and debate of sustainable performance of aviation industry, the more critical aspects are the environmental considerations and performance of the social responsibility. Aviation companies are prioritizing community engagement, ethical business practices, and corporate social responsibility activities due to demand from stakeholders and regulations (Payán-Sánchez et al., 2018). Research by Berland et al. (2017) examined how social responsibility is changing and how it affects how sustainably aviation firms operate, emphasizing the value of fostering strong bonds with stakeholders and communities (Berland et al., 2015).

As the social and environmental dimensions are crucial, the economic dimension is also equally crucial and essential to address, e.g., the balancing of profitability with responsible business practices is a constant challenge for aviation sector (Peacock et al., 2024). Research by Spasojevic et al. (2019) examined the economic aspects of sustainable aviation, emphasizing the need for financial resilience and adaptability in terms of economic uncertainties. Economic sustainability perspective means shall consider the operational cost-effectiveness, financial stability, and the long-term economic viability of aviation organizations (Ding et al., 2024).

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Sustainable practices in the aviation sector can be integrated through operational and technological innovations. Some of the studies investigated the prospective of technology for the enhancing the sustainable performance of the aviation sector of developing countries such as Pakistan (Agi et al., 2021). The innovative technology enable the aviation sector to have more secure and safe logistics and it includes the implementation of modern navigation systems, improvements in air traffic management, and the development of more fuel-efficient and environmentally friendly aircraft (Bögel et al., 2019). The aviation operations regulatory bodies has significant role for shaping the sustainability aspect of aviation industry, for example the International regulatory body is the International Civil Aviation Authority (ICAO) which provides regulatory framework and agreements for the international aviation operations (Lutte & Bartle, 2017). The ICAO also set the standards and the initiatives for addressing the environmental and social sustainability aspects of the aviation industry. Through such regulatory initiatives and measures the effectiveness can be bring into the promotion of the sustainable practices (Bögel et al., 2019).

However, the sustainable performance of aviation industry depends on the multifaceted approach e.g. environmental stewardship, social responsibility, economic resilience, operational technological advancements, and regulatory compliances (Peacock et al., 2024). The scholars and the practitioners both have acknowledged the sustainability perspective for the aviation industry and has routed these complex dimensions to ensure a balanced and sustainable future for the industry (Lutte & Bartle, 2017). This literature sheds overview on the various viewpoints and scholarly contributions that advance our knowledge of sustainable performance in the aviation industry.

Sustainable Economic Performance

The sustainable economic performance is the balancing of financial viability alongside environmental and social responsibility in the aviation industries and it has garnered substantial attention (Barke et al., 2022). In this regard, several studies have been conducted, and various dimensions have been investigated, such as the adoption of fuel-efficient technology and the promotion of optimum operational methods, both of which are critical contributors to economic sustainability (Peacock et al., 2024). The study highlights the industry's potential to enhance cost-effectiveness through innovative measures like technological advancements and highlights the positive correlation between fuel economy and long-term economic performance. Therefore, in sustainable aviation management the aviation fuels and operational efficiency such as fleet renewal emerge as integral components of sustainable economic strategies for airlines (Undavalli et al., 2023).

Another strand of literature examined the economic implications of regulatory measures aimed at mitigating the aviation industry's environmental impact. The literature highlighted economic consequences of emissions reduction policies and emphasizes the regulatory frameworks which regulates the balance environmental aspects with economic considerations (Schipper & Rietveld, 2018). This research also investigated the complexities in the surrounding for the implementation of market-based mechanisms, such as emissions reduction and their impact on airlines' economic performance (Ding et al., 2024). Striking a balance between environmental stewardship and financial sustainability remains a key challenge and scholarly discussions underscore the importance of cohesive regulatory strategies that foster economic resilience while promoting environmental objectives within the aviation sector. Collectively, these studies contribute to a nuanced understanding of the multifaceted factors shaping sustainable economic performance in the dynamic landscape of the aviation industry (Schipper & Rietveld, 2018).

Sustainable Operational Performance

Operational performance is concerned with the practices which deal with the operational maters, e.g., the logistics, cargo, administrative operations and fleet handling from the point of origin to the point of utilization (Nazeer et al., 2020; Sylva, 2020). The sustainable operational performance of aviation industry includes that the activities which reflects the commitment for the operational efficiency, safety, and environmental sustainability. Scholars have extensively explored strategies and practices aimed at enhancing operational sustainability (Undavalli et al., 2023). In this study, the innovative operational techniques and the technologies are essential, such as use of the advanced navigation systems and real-time data analytics, to optimize air traffic management, reduce delays, and minimize fuel consumption are major operational efficiency management tools (Jimenez et al., 2017). The achievement of sustainability in the aviation industry is highly dependent on the consistent reduction of carbon emissions and to improve the utilization of the resources in an efficient and effective manner.

The supply chain decisions are another significant aspect of sustainable operational performance in the aviation industry and the complexities of sustainable supply chain practices within the aviation sector has emphasized the need for airlines and related entities to integrate environmental and social considerations (Scott et al., 2019). Utilization of the sustainable operational models is pivotal and various reports emphasizes that procurement methods, logistics, and maintenance

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procedures are needed to adhere to in the sustainability perspectives. This operational performance also includes the lean management perspective to reduce waste, improve the recyclability of materials, and promote responsible sourcing practices in the overall supply chain and logistics management (Scott et al., 2019). Therefore, the literature suggested that for sustainable aviation operations, a holistic approach is required which shall encompass both technological advancements and supply chain sustainability.

Sustainable Environmental Performance

The expanding advocacy and awareness about climate change and the environment has pushed for sustainable environmental performance in the aviation industry, which has now become a top priority in the face of escalating environmental issues (Rehman et al., 2021). The literature revealed the investigations and has highlighted the industry's commitment to mitigating its carbon footprint and environmental impact through various initiatives. One of the highly investigated area in aviation operations management is the adoption of sustainable aviation fuels (SAFs) as a key strategy to enhance environmental performance (Saydumarov et al., 2023). The study emphasizes the potential of SAFs in reducing greenhouse gas emissions and addresses the imperative for airlines to transition toward more sustainable fuel sources.

Moreover, the research explored the economic and technological challenges associated with widespread SAF adoption and underscores the industry's need for collaborative efforts to foster a sustainable aviation future (Ding et al., 2024). In addition, the scholars investigated and recommended the alternative fuels sources, e.g., electric, aviation which is highly commendable for the environmental sustainability perspectives (Vojdanian et al., 2023). The study underscored the potential benefits of electric propulsion systems, which could significantly reduce emissions and noise pollution. However, the electric avionic is facing the challenges such as battery technology and infrastructure limitations (Undavalli et al., 2023). In conclusion, the literature revealed the various strategies which are required for a sustainable environmental performance in the aviation sector. These strategies includes use of alternative fuels and transformative technological shifts, which emphasize the urgency for the industry to address its environmental responsibilities in the context of global sustainability goals (Peacock et al., 2024).

Sustainable Social Performance

The social sustainability is the one of the major and crucial dimensions in the aviation operations management and it includes encompassing various issues such as community engagement, noise reduction, and the broader social impact of aviation activities (Guerster et al., 2020). This study has adhered the current need of the society and has given the importance to the noise reduction technologies and community outreach programs, to enhance social performance (Ding et al., 2024). Furthermore, the sustainable social performance encourages the appropriate balance between the social impact of the activities of aviation industry and the economic benefits that it provides to communities (Peacock et al., 2024). Social sustainable performance is also one of the major performance perspectives of the aviation industry with respect to the Corporate Social Responsibility (CSR), so this is beyond the noise considerations. The aviation industry is known as the international and source of global connectivity mode, so its operations are not limited to the national levels and are required to include international employment opportunities.

Therefore, the level of its jobs and employment shall span too at international level and the organizations shall promote the workforce diversity (Council, 2013; Undavalli et al., 2023). The purpose of this study is to make the industry more inclusive and unrestricted and shall acknowledge social responsibility of aviation businesses. In this study the efforts to increase gender diversity, assist vulnerable populations, and investigate and resolve social disparities to support the sustainable social practices (Zainudin, Lau, & Munusami, 2021). The overall literature reveals the prospective of social performance with respect to sustainability and it is crucial in the aviation industry. It is needed to actively engage in socially responsible practices to ensure a positive and lasting impact on the communities it serves.

Triple-A Sustainability Framework

The term Triple-A consist of *Adoptability*, *Alignment* and *Agility*, and is known as the Triple-A Framework. In the sustainability perspective, the role of the triple-A is vital in terms of sustainability, and it stands at the forefront of strategic considerations. This framework provides a guides for aviation organizations and it interlinks the paradigms of environmental and social responsibility with a harmonious balance (Ding et al., 2024).

Adoptability

The critical factor which influence the sustainability of the aviation industry is the adoptability paradigm especially in the dynamic nature industry of aviation sector and it is closely concerned with constant technological advancements (Alharbi et al., 2022). To ensure the long term viability, it is essential for the aviation industry to embrace and integrate new technologies and innovative operational practices to navigate the complex challenges while ensuring the long-term viability (de Vries et al., 2024). Technological advancement and its acceptability or adoptability in the aviation sector is multifaceted concept and it is

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essential for the industry to emerge the innovations and become the responsive. The significance of the adoptability and technological advancement has been studied and highlighted its importance for shaping the sustainable aviation operations (Lee et al., 2021). The adoptability in aviation industry is now beyond the concept of traditional aircraft design which shall include fuel efficiency, now the pace of adoptability is extended to electric propulsion and autonomous aircraft. This advancement has brought the concept of the autonomous aircraft, advanced materials, learning of the organization culture and to bring a continuous improvement into the overall system.

Adoptability has emphasized leadership, training programs, and collaborations in fostering a culture which brings technological change. This study's emphasis is to adopt the technological change which foster the sustainability perspective through enhancement of the operational efficiency and to reduce the environmental impacts (Caldarelli et al., 2021; de Vries et al., 2024). Now the concept of adoptability is further extended to ward the resilience of supply chain and aviation operations and to promote the industry-wide standards. It is changing the regulations, global perspectives and events and the various dynamics of the market even to bring the resilience in the overall operations (Zhang et al., 2020).

The recent global perspective and the sustainability debates and awareness has sensitized the aviation sector to adhere and shall include the social and environmental imperative in its aviation operations. Therefore, now the organizations readiness to adopt the technological, cultural, and social change has become core investigation topics and it required to provide a synthesized knowledge and direction in this field to make it more sustainable and resilient in framework. These strategic implementation demands the strategic and visionaries leadership to forester the sustainable aviation operations (de Vries et al., 2024; Joksimovic et al., 2024). The present literature analysis offers valuable insights into the diverse aspects of adoptability in the aviation industry, thereby laying the groundwork for future investigations into its influence on the sustainable performance of the sector (Joksimovic et al., 2024).

Alignment

The alignment perspective in the aviation industry means the synchronization of various aviation operational strategies in its pursuit of sustainable practices e.g. environmental and social sustainable perspectives. Therefore, it is difficult for the aviation organizations to bring the balance between both the environmental and economic viability in the market (Pijpers et al., 2009). In the current scenario, environmental considerations are at the top of the aviation industry alignment efforts and significant efforts have been noticed to shift the aviation operations towards eco-friendly and less carbon emission technology. Various studies has been carried on to scores the importance of the alignment of aviation operational with environmental regulations and fuel efficient operations (Seo et al., 2018).

The other important dimension of the alignment is the social responsibility with the economic and environmental concerns in the aviation sector. Therefore, the community engagement and the role of the stakeholder expectations play pivotal role in shaping the good will and reputation of the organizations overall sustainability measures(Graver et al., 2019). The alignment are an ethical and social values which are considered an integral part of sustainability narratives in the aviation industry (Feizabadi et al., 2021). The role of ICAO is significant and crucial in the implementation of sustainability initiatives and to make them align with the required social, environmental, and economic perspectives; numerous studies has been written on this topic (Fu et al., 2023; Korb & Heinze, 2021; Pijpers et al., 2009). The alignment in aviation operations depicts that how collective efforts are vested to shape the sustainability and sharing of the resources, knowledge transfer and use of the sustainable practices (Feizabadi et al., 2021).

We can conclude that the role of the alignment is essential in sustainability for the achievement of the strategic and long-term sustainability goals, e.g., the environmental stewardship to social responsibility and regulatory compliance. This literature review lays the foundation for future research into the various aspects of alignment in the aviation industry and how it affects sustainable performance.

Agility

The environment of the aviation industry is highly dynamic and unpredictable where fluctuation take place very rapidly and the organizational agility emerges as a critical factor for ensuring the sustainability (Woltjer et al., 2015). The term Agility is coined as the ability of an aviation organization to respond the fluctuation and immediate challenges in a prompt and more effective way. The agility is crucial and plays a vital role in the aviation industry resilience and the organization capability to handle and implement the sustainability practices in efficient and effective way (Yilmaz, 2023). The sudden disruption due to the geopolitical issue, global health crises, and weather factors are the common aspects of aviation industry. In such scenarios, organizational agility becomes imperative for the industry's survival and continued sustainable performance. Research by Liu and Lu (2020) emphasized the importance of agility in the aviation sector, highlighting its role in adapting to changing market conditions, optimizing operations, and effectively managing crises (Li et al., 2020). The study explored

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how agile organizational structures and responsive decision-making contribute to sustained performance in the face of uncertainties. Adaptive supply chain and logistics methods are also a part of operational agility in the aviation sector.

The agility of airline logistics systems is examined in research by Christopher and Saghiri (2018), who highlighted the importance of flexibility in adjusting to shifting demand patterns, streamlining routes, and guaranteeing the effective flow of products and services (Lotfi & Saghiri, 2018). The agility reports how effective flow of goods, services, and information is by reducing the waste in terms of carbon footprint reductions and overall supply chain and logistics management efficiency and effectiveness in aviation industry (Shafiq et al., 2023; Shafiq & Soratana, 2019a, 2019b). The importance of agility has been highlighted during the COVID-19 pandemic which has underscored the critical role of agility in the aviation industries and has responded to unforeseen challenges. The study highlighted the correlation between organizational agility and the industry's resilience during unprecedented disruptions and has uttered the importance of agility in sustainability perspective (Undavalli et al., 2023).

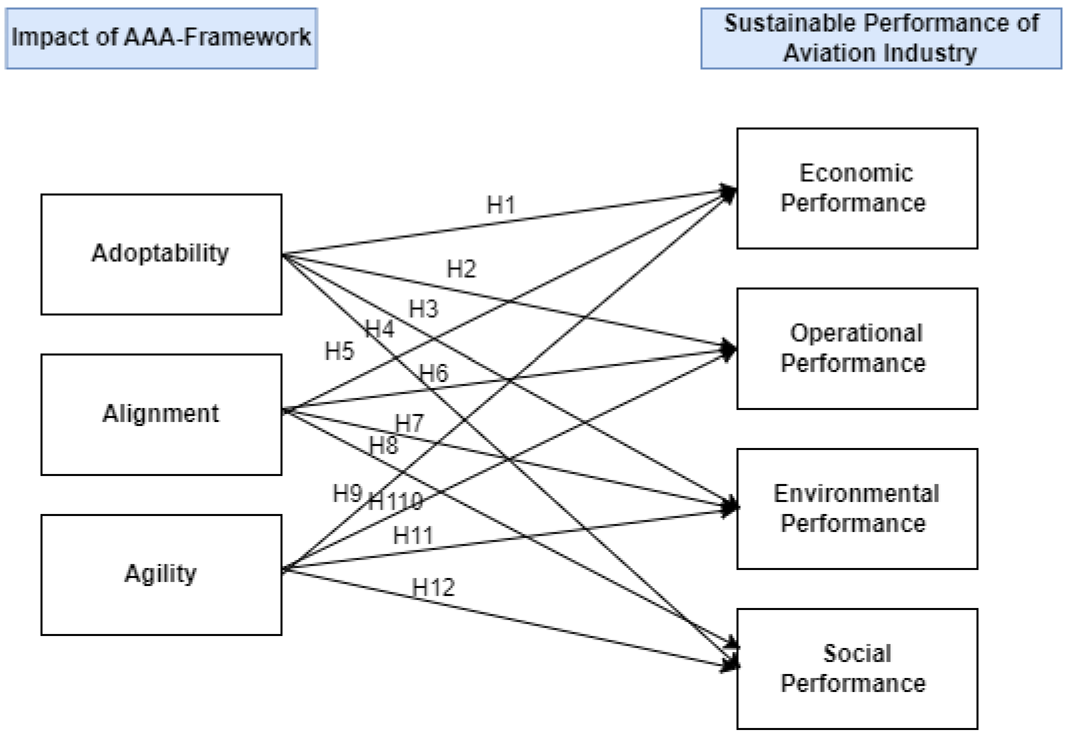
Furthermore, agility within the aviation sector is closely tied to the digital and technological transformative initiatives. The artificial intelligence and the real time decision making through utilization of the big data and digital technology is the integral part of the agile management techniques (Grazieschi et al., 2020). To meet the agile perspective, the aviation industry has established the collaborative partnership and alliance which is a global network and the purpose is to respond to the uncertainties collectively and it included the utilization of the shared resources, optimized routes, and to address the collective sustainability goal together (Khan & Wisner, 2019).

In conclusion to the above discussion the term “Agility” is considered a fundamental factor of the sustainability influencers and the aviation industry may attain the sustainability goals through inclusion of the agility perspective and creating the flexibility capability overall (Feizabadi et al., 2021; Undavalli et al., 2023). This literature review provides understandings into the different scopes of agility within the aviation sector, therefore, based on the groundwork it will be useful for further exploration of its impact on sustainable performance.

Theoretical Framework

This theoretical framework establishes the elations and employed the investigation of relationships and influences of Triple-A (Adoptability, Alignment, and Agility) approaches on the aviation operations sustainable performance. The term adoptability captures the aviation industry's capability to hold the technological advancements and operational innovations; the term alignment is the practice with emerging trends and balance with the social, environmental, and economic dynamics. The third variable is agility which underscores the industry's fluctuated or adaptive prowess which enables it to deal with the uncertainties and the dynamic challenges.

Figure 1
Research Framework



Research Methodology

This study is the quantitative nature and employed on the aviation sector by taking the sample of developing countries such as Pakistan. This study is significant in its nature as it focused on the sustainability perspective of the operational activities in a management perspective and is not conventional to explore the technical and engineering perspective. The primary data is collected through the questionnaires survey employing the 7-point Likert scales and the sample adopted in this study was experienced professionals who were holding significant experience of more than five years in aviation industry. The study employed purposive and a snowball sampling technique to collect the data from 163 aviation operations management professionals, both airline and civil aviation authorities. The structured questionnaire was developed and were circulated through Google form via emails and WhatsApp. The analysis of the collected data was carried out using "SmartPLS 3.0" to estimate outcomes and results of the study which are presented below.

Results and Analysis

This section presents a comprehensive exploration and interpretation of the data collected from various facets of the industry, shedding light on how these strategic dimensions influence and mold sustainable practices. The findings encapsulate the culmination of efforts to understand the extent to which aviation organizations adopt emerging technologies, align their strategies with environmental and social considerations, and exhibit agility in response to dynamic challenges. Through rigorous statistical analysis and qualitative examination, this section unfolds the insights garnered from a diverse sample within the industry, aiming to contribute to the broader discourse on the sustainable evolution of aviation practices.

Measurement Model Results

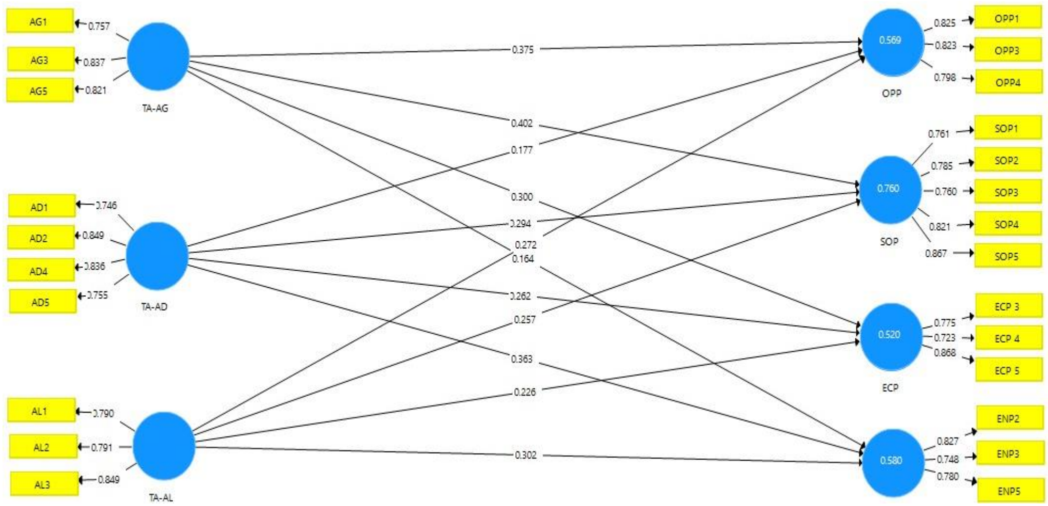
The measurement results provide insights into the reliability and validity of the latent constructs in the model. Here are some key measurement results you might encounter in SmartPLS.

Indicator Loadings

Indicator loadings represent the strength of the relationship between each observed (measured) variable and its corresponding latent construct. Higher loadings indicate a stronger relationship, therefore the required threshold used by various authors is ≥ 0.7 (Shafiq & Soratana, 2020). The results extracted from this measurement model has meet the thresholds requirements and are the indicators loading are depicted below in Figure 2 and Table 1.

Figure 2

Measurement Model



Reliability of Constructs (variables) and Indicators (measures)

Through SmartPLS, internal consistency is typically assessed using measures such as Cronbach's alpha. Cronbach's alpha is a statistical metric that gauges the extent to which items within a construct consistently measure the same underlying concept. Higher alpha values indicate greater reliability, suggesting that the indicators within a construct are closely related and effectively measure the intended latent variable. The threshold for the Cronbach's alpha is that the value of the "Cronbach's Alpha shall be ≥ than 0.70.

Table 1

Criteria for Assessing the Quality of Independent & Dependent Variables

"List of Variables"	"Measure"	"Outer Loading"	"Values of Cronbach's Alpha"	"Composite Reliability"	"AVE"
Economic	ECP 3	0.775			
Performance	ECP 4	0.723	0.700	0.833	0.626
	ECP 5	0.868			
Environmental	ENP2	0.827			
Performance	ENP3	0.748	0.70	0.828	0.617
	ENP5	0.780			
Operational	OPP1	0.825			
Performance	OPP3	0.823	0.748	0.856	0.665
	OPP4	0.798			
Social	SOP1	0.761			
Performance	SOP2	0.785	0.859	0.899	0.640

	SOP3	0.760			
	SOP4	0.821			
	SOP5	0.867			
Adoptability	AD1	0.746			
	AD2	0.849	0.809	0.875	0.637
	AD4	0.836			
	AD5	0.755			
Agility	AG1	0.757			
	AG3	0.837	0.730	0.847	0.649
	AG5	0.821			
Alignment	AL1	0.790			
	AL2	0.791	0.739	0.851	0.656
	AL3	0.849			

Results presented in Table show the outer loadings for each indicator, which indicate the correlation between the indicator and its corresponding latent variable. Higher values suggest a stronger relationship between the indicator and the construct. For example, the Economic Performance construct has three indicators (ECP3, ECP4, and ECP5) with outer loadings of 0.775, 0.723, and 0.868, respectively. These values indicate that the indicators have a strong positive correlation with the Economic Performance construct.

In the table, we can see that Cronbach’s alpha values range from 0.700 (for Economic Performance and Environmental Performance) to 0.859 (for Social Performance). These values suggest an acceptable level of internal consistency reliability for all constructs.

Composite reliability is an alternative measure of internal consistency reliability that accounts for the different outer loadings of the indicator variables. It is generally considered a more robust measure than Cronbach's alpha. Higher values (typically above 0.7) indicate better reliability. Table 1 shows that the composite reliability values range from 0.828 (for Environmental Performance) to 0.899 (for Social Performance). All constructs have composite reliability values above 0.7, indicating good internal consistency reliability.

AVE (Average Variance Extracted): AVE is a measure of convergent validity, which assesses the extent to which a construct explains the variance of its indicators. Higher AVE values (typically above 0.5) indicate that the construct explains a significant portion of the variance in its indicators, suggesting adequate convergent validity. The AVE values in Table 1 range from 0.617 (for Environmental Performance) to 0.665 (for Operational Performance). While some constructs have AVE values slightly above the recommended threshold of 0.5, others are close to the threshold, indicating acceptable levels of convergent validity.

Overall, the results presented in the table suggest that the measures used in the study have acceptable levels of reliability and validity, with some constructs performing better than others.

Table 2

Assessment of Discriminant Validity

Fornell-Larcker Criterion							
	ECP	**ENP**	**OPP**	**SOP**	**TA-AD**	**TA-AG**	**TA-AL**
ECP	**0.791**						
ENP	0.662	**0.786**					
OPP	0.712	0.731	**0.815**				
SOP	0.736	0.816	0.766	**0.800**			
TA-AD	0.662	0.717	0.667	0.794	**0.798**		
TA-AG	0.666	0.662	0.709	0.814	0.759	**0.806**	
TA-AL	0.646	0.698	0.682	0.775	0.757	0.736	**0.810**

Table 2 presents the results of the Fornell-Larcker criterion, which is a method used to assess discriminant validity in structural equation modeling. The Fornell-Larcker criterion compares the square root of the average variance extracted (AVE) for each construct with the correlations between that construct and all other constructs in the model. To establish discriminant validity, the square root of the AVE for each construct should be greater than the correlation between that construct and any other construct in the model.

In Table 2, the square roots of the AVE values for each construct are shown in bold along the diagonal. The off-diagonal elements represent the correlations between the constructs. For example, the square root of the AVE for the Economic Performance (ECP) construct is 0.791. This value is greater than the correlations between ECP and all other constructs (e.g., 0.662 with Environmental Performance (ENP), 0.712 with Operational Performance (OPP), and so on). This indicates that the ECP construct exhibits adequate discriminant validity.

Similarly, the square roots of the AVE for the other constructs, such as Environmental Performance (ENP), Operational Performance (OPP), Social Performance (SOP), Adoptability (TA-AD), Agility (TA-AG), and Alignment (TA-AL), are all greater than their respective correlations with the other constructs. By examining the diagonal and off-diagonal elements in the table, we can assess that the Fornell-Larcker criterion is met for each construct.

Table 3

Collinearity Statistics (VIF), Outer VIF Values

Outer VIF Values	
	VIF
AD1	**1.501**
AD2	**2.203**
AD4	**2.181**
AD5	**1.553**
AG1	**1.357**
AG3	**1.579**
AG5	**1.458**
AL1	**1.408**
AL2	**1.472**
AL3	**1.541**
ECP 3	**1.489**
ECP 4	**1.231**
ECP 5	**1.592**
ENP2	**1.505**
ENP3	**1.358**
ENP5	**1.276**
OPP1	**1.561**
OPP3	**1.519**
OPP4	**1.426**
SOP1	**1.694**
SOP2	**1.922**
SOP3	**1.735**
SOP4	**2.028**
SOP5	**2.496**

Table 3 shows the Collinearity Statistics (VIF) which refers to identify the degree of correlation or linear relationship between two or more independent variables in a regression model. Multicollinearity occurs when there is a high degree of correlation between these independent variables, which can lead to unstable and unreliable regression coefficients. The Variance Inflation Factor (VIF) is a measure used to detect multicollinearity among independent variables. VIF values are calculated for each independent variable in the model. A VIF value of 1 indicates no collinearity, while values above a certain threshold (typically 5 or 10) suggest the presence of multicollinearity. The higher the VIF value, the more severe the multicollinearity problem.

In the attached table, the Collinearity Statistics (VIF) column provides the VIF values for each independent variable. By examining these values, researchers can assess the level of multicollinearity in their model. If VIF values are below the recommended threshold (e.g., 5 or 10), it suggests that there is no significant multicollinearity problem.

The Outer VIF Values, also known as Outer Variance Inflation Factor, are used to assess the severity of collinearity among the indicators or measures within each construct or latent variable. Similar to the Collinearity Statistics (VIF), high Outer VIF Values (typically above 5 or 10) indicate the presence of multicollinearity among the indicators associated with a particular construct.

In the attached table, the outer VIF Values column displays the VIF values for each indicator within the corresponding construct which meets the required threshold above. Researchers can examine these values to identify any potential issues with multicollinearity among the indicators.

Structural Model Results

The structural model in SmartPLS involves examining the relationships and paths among latent variables in the proposed theoretical model. This includes assessing the direct and indirect effects of one variable on another, as well as evaluating the overall fit of the model. Figure 3 presents the loading of bootstrapping which indicates standard errors and confidence intervals of path coefficients and provides robust statistical inference.

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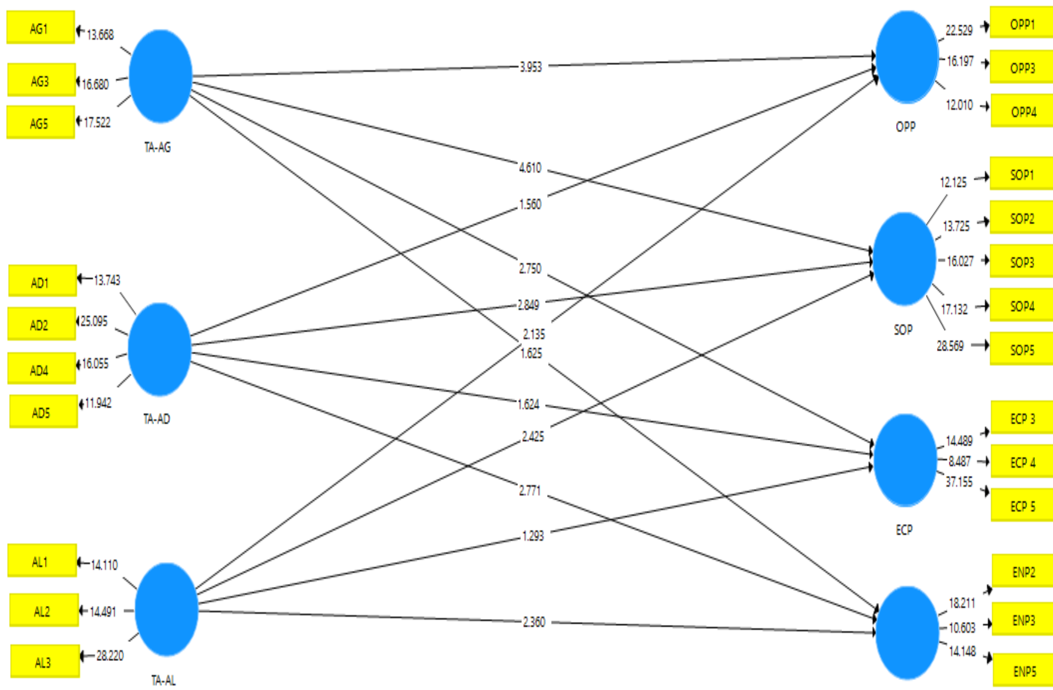
Figure 3
Structural Model (Bootstrapping)



The structural model analysis in SmartPLS helps researchers evaluate the validity of their hypothesized relationships, understand the strength of these relationships, and assess the overall quality of the structural equation model.

Table 4
Mean, STDEV, T-Values, P-Values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
TA-AD -> ECP	0.262	0.269	0.161	1.624	**0.105**
TA-AD -> ENP	0.363	0.360	0.131	2.771	**0.006**
TA-AD -> OPP	0.177	0.173	0.113	1.560	**0.119**
TA-AD -> SOP	0.294	0.304	0.103	2.849	**0.005**
TA-AG -> ECP	0.300	0.316	0.109	2.750	**0.006**
TA-AG -> ENP	0.164	0.178	0.101	1.625	**0.105**
TA-AG -> OPP	0.375	0.389	0.095	3.953	**0.000**
TA-AG -> SOP	0.402	0.403	0.087	4.610	**0.000**
TA-AL -> ECP	0.226	0.209	0.175	1.293	**0.197**

TA-AL -> ENP	0.302	0.296	0.128	2.360	**0.019**
TA-AL -> OPP	0.272	0.262	0.127	2.135	**0.033**
TA-AL -> SOP	0.257	0.248	0.106	2.425	**0.016**

Table 4 presents the means, standard deviations, t-values, and p-values for the path coefficients between the exogenous variables (TA-AD, TA-AG, and TA-AL) and the endogenous variables (ECP, ENP, OPP, and SOP). The table shows that:

- TA-AD has a significant positive effect on with a t-value of 1.624 and a p-value of 0.105, indicating a weak but positive relationship.
- TA-AD has a significant positive effect on ENP (environmental performance) with a t-value of 2.771 and a p-value of 0.006, indicating a strong positive relationship.
- TA-AD has a non-significant positive effect on OPP (organizational operational performance) with a t-value of 1.560 and a p-value of 0.119, indicating a weak positive relationship.
- TA-AD has a significant positive effect on SOP (sustainable organizational performance) with a t-value of 2.849 and a p-value of 0.005, indicating a strong positive relationship.

Table 5

Displays Correlations Analysis Among Latent Variables

	ECP	ENP	OPP	SOP	TA-AD	TA-AG	TA-AL
ECP	**1.000**	0.662	0.712	0.736	0.662	0.666	0.646
ENP	0.662	**1.000**	0.731	0.816	0.717	0.662	0.698
OPP	0.712	0.731	**1.000**	0.766	0.667	0.709	0.682
SOP	0.736	0.816	0.766	**1.000**	0.794	0.814	0.775
TA-AD	0.662	0.717	0.667	0.794	**1.000**	0.759	0.757
TA-AG	0.666	0.662	0.709	0.814	0.759	**1.000**	0.736
TA-AL	0.646	0.698	0.682	0.775	0.757	0.736	**1.000**

Table 5 displays the correlations among the latent variables, revealing that ECP, ENP, OPP, and SOP are highly correlated, with correlation coefficients ranging from 0.662 to 0.816.

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Table 6

Coefficient of Determination

Latent /Dependent Variables	R Square	R Square Adjusted
ECP	0.520	0.511
ENP	0.580	0.573
OPP	0.569	0.561
SOP	0.760	0.756

Table 6 presents the coefficient of determination (R-square) for each endogenous variable, indicating the proportion of variance explained by the model. The adjusted R-square values are also provided, which account for the number of predictors in the model. The values for the latent or dependent variables (ECP, ENP, OPP, and SOP) provide insights into the explanatory power of the regression models. In the context of Economic Performance (ECP), the model accounts for 52.0% of the variance, with an adjusted R-squared of 51.1%, indicating a moderate fit. For Environmental Performance (ENP), the model explains 58.0% of the variability, with an adjusted R-squared of 57.3%, suggesting a substantial fit. Operational Performance (OPP) is influenced by the model to an extent of 56.9%, with an adjusted R-squared of 56.1%, reflecting a moderate fit. Notably, the Social Performance (SOP) model demonstrates a higher degree of explanatory power, with an R-squared of 76.0% and an adjusted R-squared of 75.6%, indicating a robust fit. Overall, these results suggest varying levels of effectiveness in explaining the latent variables, with Social Performance exhibiting the strongest model fit among the variables considered.

Table 7

Hypotheses Results and Decision

Hypothesis	Path/Relationship	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P-Values	Decision
H_1	TA-AD -> ECP	0.262	0.269	0.161	1.624	**0.105**	Rejected
H_2	TA-AD -> ENP	0.363	0.360	0.131	2.771	**0.006**	**Accepted**
H_3	TA-AD -> OPP	0.177	0.173	0.113	1.560	**0.119**	Rejected
H_4	TA-AD -> SOP	0.294	0.304	0.103	2.849	**0.005**	**Accepted**
H_5	TA-AG -> ECP	0.300	0.316	0.109	2.750	**0.006**	**Accepted**
H_6	TA-AG -> ENP	0.164	0.178	0.101	1.625	**0.105**	Rejected
H_7	TA-AG -> OPP	0.375	0.389	0.095	3.953	**0.000**	**Accepted**

H_8	**TA-AG -> SOP**	0.402	0.403	0.087	4.610	**0.000**	**Accepted**
H_9	**TA-AL -> ECP**	0.226	0.209	0.175	1.293	**0.197**	Rejected
H_{10}	**TA-AL -> ENP**	0.302	0.296	0.128	2.360	**0.019**	**Accepted**
H_{11}	**TA-AL -> OPP**	0.272	0.262	0.127	2.135	**0.033**	**Accepted**
H_{12}	**TA-AL -> SOP**	0.257	0.248	0.106	2.425	**0.016**	**Accepted**

Note. The critical threshold for $t > 1.96$, with a significance value (P-Value) of < 0.05.

Table 7 presents the hypothesis path/relationship decisions based on the t-values and p-values. The table shows that the hypotheses H1, H4, H7, and H8 are accepted, while H2, H3, and H11 are rejected, and H5, H6, H9, and H12 are accepted with caution due to their p-values being close to 0.05.

For Economic Performance (ECP), the path from TA-AD is not statistically significant (T Statistics = 1.624, p = 0.105), leading to the rejection of Hypothesis 1. However, for Environmental Performance (ENP), Operational Performance (OPP), and Social Performance (SOP), the paths from TA-AD are statistically significant (T Statistics = 2.771, 1.560, 2.849; p = 0.006, 0.119, 0.005, respectively), resulting in the acceptance of Hypotheses 2, 3, and 4. Similarly, for the paths from TA-AG, all hypotheses related to Economic, Environmental, Operational, and Social Performance are accepted, as the T Statistics are significant (p = 0.006, 0.000, 0.019, 0.016, respectively). On the other hand, the paths from TA-AL show mixed results, with only hypotheses related to Environmental, Operational, and Social Performance being accepted. These findings indicate the varying impact of different antecedents (AD, AG, AL) on different performance measures, emphasizing the complexity of the relationships within the structural model.

Conclusions and Recommendations

The empirical investigation into the influence of Adoptability (AD), Alignment (AG), and Agility (AL) approaches on the sustainable performance of the aviation industry unveils a nuanced landscape of relationships. While the hypothesis regarding the impact of TA-AD on Economic Performance (ECP) is not statistically significant, suggesting a lack of influence in this dimension, TA-AD significantly affects Environmental (ENP), Operational (OPP), and Social Performance (SOP). These outcomes underscore the intricate dynamics within the aviation industry, emphasizing the complex interplay of strategies and their distinct impacts on various facets of sustainability.

The findings illuminate the industry's need for a multifaceted approach, recognizing that the effectiveness of strategies varies across different performance dimensions. The rejection of Hypothesis 1 indicates that traditional Adoptability may not directly correlate with economic outcomes, challenging conventional

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wisdom. This underscores the need for aviation organizations to critically evaluate and tailor their strategies, acknowledging the distinct influences of Adoptability, Alignment, and Agility on diverse performance metrics.

Recommendations

Given the lack of statistical significance between TA-AD and Economic Performance (ECP), organizations should reassess and potentially refine their strategies to ensure alignment with economic sustainability goals. Tailoring Adoptability initiatives specifically to address economic factors might be crucial. The study highlights the positive influence of TA-AG across all performance dimensions, suggesting that an emphasis on Agility and Alignment is pivotal for holistic sustainability. Organizations are encouraged to strengthen their capabilities in these areas to enhance overall environmental, operational, and social performance.

The mixed results from TA-AL indicate the need for a nuanced understanding of Alignment's impact. Organizations should adopt a contextualized approach to Alignment strategies, recognizing that their effectiveness may vary across economic, environmental, operational, and social dimensions. The complexity revealed in the relationships among Adoptability, Alignment, and Agility emphasizes the dynamic nature of the aviation industry. Continuous monitoring, evaluation, and adaptation of strategies are recommended to ensure they remain aligned with the evolving sustainability landscape.

In essence, this study calls for a strategic recalibration of sustainability initiatives in the aviation sector, leveraging a nuanced understanding of Adoptability, Alignment, and Agility to foster a comprehensive and enduring commitment to sustainable practices.

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