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TECHNOLOGY ADOPTION AND DIGITAL TRANSFORMATION OF NIGERIAN CIVIL AVIATION AUTHORITY: MODERATING STRATEGIC ORIENTATION

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ABSTRACT

The study titled "Technology Adoption and Digital Transformation of the Nigerian Civil Aviation Authority (NCAA)" explores the relationship between technology adoption and digital transformation within the aviation sector in Nigeria. Technology adoption is analyzed through its dimensions: perceived usefulness, compatibility, and organizational readiness, while digital transformation is examined via organizational agility, workforce enablement, and operational Efficiency. The research employs a cross-sectional survey design, targeting senior staff across key Nigerian airlines, and utilizes Structural Equation Modeling (SEM) to assess the interaction between variables.

The findings highlight that organizational Readiness strongly predicts successful technology adoption, followed by perceived Usefulness and Compatibility. These dimensions collectively influence digital transformation outcomes, with organizational Readiness playing a pivotal role in ensuring infrastructure and human resource adequacy. Digital transformation is positively associated with organizational agility, workforce enablement, and operational Efficiency, demonstrating that technology adoption directly enhances these areas. Furthermore, strategic Orientation moderates the relationship, aligning technological initiatives with organizational goals.

The study concludes that addressing challenges such as inadequate infrastructure, skills gaps, and regulatory barriers is crucial for leveraging technology adoption to drive digital transformation. It recommends investments in infrastructure, employee training, and the development of a digital transformation roadmap. Public-private partnerships and policy revisions are also advocated to foster a supportive ecosystem for innovation.

Keywords: Technology adoption, digital transformation, organizational Readiness, aviation sector, strategic Orientation.

1.0 INTRODUCTION

The rapid advancement of technology has transformed industries globally, including aviation, which relies heavily on digital tools for Efficiency, safety, and competitiveness. In the context of the Nigerian Civil Aviation Authority (NCAA), the adoption of technology is critical for overcoming operational inefficiencies, enhancing regulatory oversight, and improving stakeholder collaboration. Digital transformation in aviation involves integrating digital tools and technologies to optimize processes, enable workforce capabilities, and achieve operational

Volume: 08, Issue: 02 March - April 2025

ISSN 2582-0176

Efficiency, yet its realization in Nigeria remains hindered by various challenges. Understanding technology adoption and its dimensions—perceived Usefulness, Compatibility, and organizational Readiness—provides a foundation for addressing these challenges. Furthermore, strategic Orientation plays a pivotal moderating role in aligning these dimensions with organizational goals, ultimately fostering successful digital transformation.

Technology adoption refers to the process by which organizations accept, implement, and use new technologies to enhance their operations. Davis (1989), in the seminal Technology Acceptance Model (TAM), identified perceived Usefulness and perceived ease of use as key determinants of technology adoption. Perceived Usefulness, defined as the degree to which technology improves job performance, is particularly relevant in the aviation sector, where Efficiency and accuracy are paramount. Empirical studies by Venkatesh et al. (2003) expanded TAM into the Unified Theory of Acceptance and Use of Technology (UTAUT), emphasizing the importance of organizational Readiness and contextual Compatibility in adoption decisions.

In the Nigerian aviation context, the perceived Usefulness of digital tools such as electronic flight management systems or online booking platforms can address critical inefficiencies such as flight delays and resource mismanagement. When stakeholders, including NCAA officials, airline operators, and agents, perceive these tools as essential to improving decision-making and customer service. Empirical evidence from Oladimeji et al. (2020) showed that perceived Usefulness significantly influenced the adoption of automated systems in Nigeria's logistics sector, with implications for aviation.

Compatibility, defined as the alignment of technology with existing processes, values, and needs, plays a vital role in ensuring seamless integration. In the aviation industry, technologies that align with global safety standards, such as International Civil Aviation Organization (ICAO) guidelines, are more likely to be embraced. Compatibility reduces resistance and enables customization for local needs, which is crucial for Nigeria's regulatory and operational landscape. Studies by Adewale and Abiodun (2019) highlighted that Compatibility was a critical success factor in implementing enterprise resource planning systems in Nigerian public institutions.

Organizational Readiness, encompassing the financial, infrastructural, and human resource capacity to adopt technology, is another dimension central to the success of digital transformation. In Nigeria's aviation sector, Readiness involves investment in training personnel, upgrading IT infrastructure, and securing adequate funding for technological initiatives. Empirical evidence from Adebayo and Opesade (2021) found that organizational Readiness positively impacted the adoption of digital payment systems in Nigeria, illustrating its importance for sectors with high transactional demands.

More so, The Nigerian aviation sector faces challenges such as inefficiencies in passenger processing, outdated operational systems, inadequate safety oversight, and poor service delivery. Perceived Usefulness addresses inefficiencies by showcasing tangible benefits of digital systems, such as automated check-ins and real-time flight tracking. Compatibility ensures that adopted technologies integrate smoothly with existing workflows, reducing disruptions and aligning with international best practices. Organizational Readiness mitigates

Volume: 08, Issue: 02 March - April 2025

ISSN 2582-0176

resistance and ensures sustained adoption through adequate resources, training, and leadership support.

The benefits of addressing these dimensions include improved safety standards, enhanced customer experience, streamlined operations, and compliance with international regulations. When adopted effectively, technologies such as predictive maintenance systems and advanced passenger information systems can revolutionize operations, fostering trust among stakeholders and elevating Nigeria's aviation reputation globally.

It follows that these dimensions are interrelated and collectively influence technology adoption outcomes. For instance, high perceived Usefulness can drive organizational commitment, while Compatibility ensures that technologies are accepted by employees and aligned with operational goals. Organizational Readiness supports sustained implementation by providing necessary resources. Together, these dimensions impact the NCAA's regulatory effectiveness, enable airline operators to improve Efficiency, and empower agents to deliver better customer service. The government benefits through enhanced compliance with global standards and increased aviation revenue.

Globally, studies have shown the effectiveness of these dimensions in driving digital transformation. For instance, Chandra and Kumar (2021) demonstrated that Compatibility and perceived Usefulness were pivotal in the successful implementation of automated air traffic control systems in India. In Africa, studies by Muriithi and Wachira (2022) revealed that organizational Readiness was a key enabler of e-government services in Kenya's transport sector, drawing parallels to the aviation industry.

Furthermore, strategic Orientation, defined as an organization's approach to aligning its resources and strategies with its goals, moderates the relationship between technology adoption dimensions and digital transformation outcomes. By prioritizing strategic orientations such as innovation, customer focus, and operational excellence, organizations can better leverage technology to achieve transformation. In Nigeria, strategic Orientation enables the NCAA to align technological initiatives with industry goals, such as improved safety compliance and enhanced passenger satisfaction.

For example, fostering an innovation-oriented culture encourages proactive adoption of cutting-edge tools, while a customer-focused orientation ensures that adopted technologies enhance service delivery. Research by Alqahtani et al. (2021) underscored the importance of strategic Orientation in driving digital transformation in the Saudi aviation industry, suggesting its relevance in Nigeria.

The dimensions of technology adoption can address digital transformation challenges, measured through organizational agility, workforce enablement, and operational Efficiency. Organizational agility, or the ability to adapt to changes swiftly, improves when technologies align with workflows and enhance decision-making. Workforce enablement benefits from perceived Usefulness as employees adopt tools that facilitate productivity. Operational Efficiency, crucial for reducing costs and improving reliability, is achieved through Readiness, ensuring seamless implementation.

Volume: 08, Issue: 02 March - April 2025

ISSN 2582-0176

By integrating strategic Orientation, these dimensions can be tailored to address Nigeria's unique challenges. For instance, adopting a safety-oriented strategy ensures that technologies align with regulatory priorities, fostering compliance and operational integrity. Ultimately, leveraging these dimensions with strategic guidance can transform the Nigerian aviation sector into a globally competitive industry.

1.2 Problem Statement

Digital transformation, the integration of digital technologies into all areas of operations to enhance Efficiency and value creation, has become essential for industries worldwide, including aviation. In Nigeria, the aviation industry is critical to economic growth, connecting the country to global markets and fostering tourism, trade, and business development. However, the sector's digital transformation has been slow and problematic, manifesting inefficiencies, poor service delivery, outdated operational processes, and safety concerns. These challenges hinder the industry's ability to compete globally and meet the demands of modern aviation stakeholders.

The manifestations of the problem include limited adoption of modern air traffic management systems, inadequate passenger processing technologies, reliance on paper-based documentation, and poor data integration across airlines, regulatory authorities, and service providers. This digital lag results in delayed flights, resource mismanagement, and an inability to meet international safety and service standards. Furthermore, the absence of robust cybersecurity measures exposes critical aviation systems to potential breaches, compounding operational vulnerabilities.

Several factors contribute to these challenges. Financial constraints and limited infrastructure investment hinder the adoption of advanced technologies. Additionally, a lack of organizational Readiness, including insufficient training for aviation personnel and resistance to change, exacerbates the issue. Compatibility with existing systems and processes poses another challenge, as outdated infrastructure struggles to integrate with modern digital tools. Lastly, the perception of technology adoption as costly and complex deters stakeholders from fully embracing digital transformation.

The effects of these challenges are significant, impacting the industry's Efficiency, safety, and overall competitiveness. Operational inefficiencies lead to high costs for airlines and passengers, while inadequate safety measures tarnish Nigeria's reputation in global aviation. Poor customer experiences, driven by delays and service inconsistencies, further erode trust in the sector. Additionally, regulatory inefficiencies undermine the NCAA's ability to ensure compliance with international standards, threatening Nigeria's position in global aviation networks.

Addressing these challenges requires leveraging technology adoption dimensions: perceived Usefulness, Compatibility, and organizational Readiness. By demonstrating the tangible benefits of digital tools, such as improved operational Efficiency and enhanced safety compliance, stakeholders can be encouraged to adopt these technologies. Compatibility ensures that new systems align with existing workflows and regulatory requirements, facilitating seamless integration and reducing resistance. Organizational Readiness, encompassing

Volume: 08, Issue: 02 March - April 2025

ISSN 2582-0176

adequate financial resources, infrastructure, and personnel training, is crucial for successful implementation.

Other scholars have proposed various approaches to overcoming digital transformation challenges in Nigeria's aviation sector. For instance, Adebayo and Opesade (2021) emphasized the need for substantial investment in IT infrastructure and capacity-building initiatives to enhance organizational Readiness. Oladimeji et al. (2020) recommended targeted education campaigns to increase awareness of the benefits of digital tools among aviation stakeholders. Similarly, Adewale and Abiodun (2019) argued that the alignment of technologies with international standards enhances Compatibility and promotes global competitiveness.

Despite these insights, existing studies often focus on broader aspects of technology adoption without explicitly addressing the interplay of these dimensions in fostering digital transformation within Nigeria's aviation sector. Furthermore, limited attention has been given to the moderating role of strategic Orientation in aligning technology adoption efforts with organizational goals. This gap highlights the need for research that integrates strategic Orientation into the framework for addressing digital transformation challenges in the sector.

Digital transformation offers a comprehensive solution to the challenges facing Nigeria's aviation industry by enabling the integration of advanced technologies that enhance operational Efficiency, workforce enablement, and organizational agility. For example, adopting real-time data analytics for flight scheduling can reduce delays, while automated check-in systems can improve passenger experiences. Predictive maintenance tools can enhance safety and reliability, addressing critical concerns within the sector.

This study departs from previous works by emphasizing the critical role of strategic Orientation in bridging the gap between technology adoption and successful digital transformation. Strategic Orientation, which encompasses innovation, customer focus, and operational excellence, serves as a guiding framework for aligning technological initiatives with organizational objectives. By fostering an innovation-oriented culture, the NCAA and airline operators can proactively embrace cutting-edge technologies that address industry challenges. A customer-focused approach ensures that digital transformation efforts prioritize improved passenger experiences while operational excellence drives the optimization of workflows and resource allocation. It is against this backdrop the study examines technology adoption and digital transformation in NCCA.

2.0 LITERATURE REVIEW

2.1 Conceptual Framework

This section explains the key concept of the study, starting with the criterion variable as presented below as follows;

2.2 Conceptual Review

International Journal of Social Sciences and Management Review

Volume: 08, Issue: 02 March - April 2025

ISSN 2582-0176

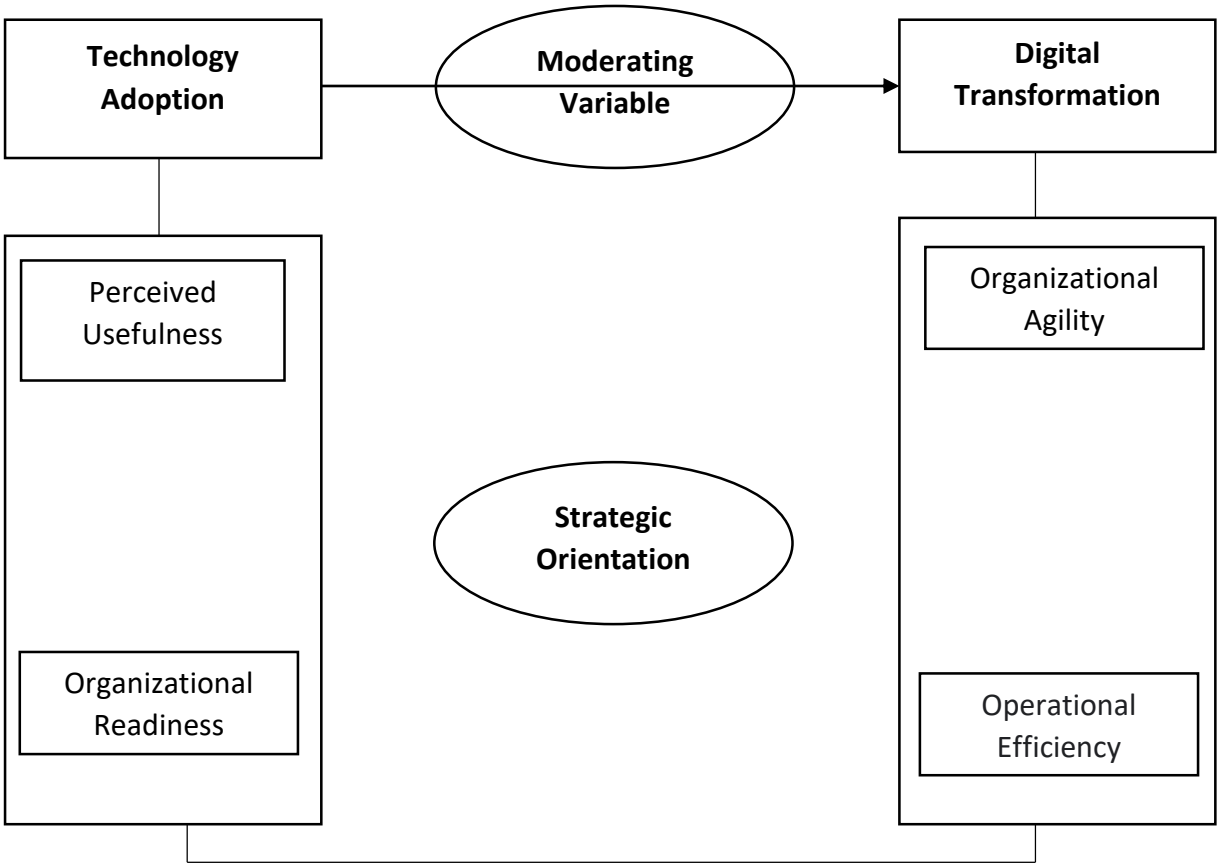

Figure 2.1: Conceptual Model of the Relationship between Technology Adoption and Digital Transformation of Nigerian Civil Aviation Authority; Moderating Strategic Orientation.

Source: Conceptualized by Silva Opuala-Charles (2024) and adapted from adapted from: Technology adoption (Perceived usefulness-Davis, F. D. (1989); Compatibility - Rogers, E. M. (2003), Organizational Readiness - . Tornatzky, L. G., & Fleischer, M. (1990)). Digital transformation (Organizational agility- Westerman, G., Bonnet, D., & McAfee, A. (2014); Workforce enablement - McKinsey Digital (2023); Operational Efficiency - Davenport, T. H., & Lacity, M. C. (2018). The moderating variable is Strategic Orientation - Gatignon, H., & Xuereb, J. M. (1997)

2.3 Theoretical Framework of the Study

The study of technology adoption and digital transformation is grounded in several foundational theories that explain how individuals and organizations embrace new technologies. These theories provide a conceptual framework for understanding the dynamics of adoption and their implications for industries such as aviation. In the context of Nigeria's aviation sector, these theories help elucidate the factors driving or hindering digital transformation, aligning well with the study's focus on leveraging technology adoption to overcome industry challenges.

1. Technology Acceptance Model (TAM)- Proposed by Davis (1989).

Volume: 08, Issue: 02 March - April 2025

ISSN 2582-0176

The Technology Acceptance Model (TAM) is one of the most widely cited theories in understanding technology adoption. The model posits that two core factors—perceived usefulness and perceived ease of use—determine an individual's intention to adopt technology. Perceived Usefulness refers to the degree to which a user believes that using a technology will enhance their job performance, while perceived ease of use pertains to how effortless the technology is to use.

This theory is directly relevant to the Nigerian aviation sector because the industry's stakeholders, including the NCAA, airline operators, and agents, often weigh the perceived Usefulness of digital tools, such as automated systems, in addressing operational inefficiencies. For instance, if airline personnel perceive that digital tools can reduce flight delays or enhance safety compliance, they are more likely to adopt them. Similarly, the ease of integrating these tools into existing workflows can influence their acceptance across the industry.

2. Diffusion of Innovations (DOI)- Developed by Rogers (1962).

The Diffusion of Innovations (DOI) theory explains how innovations are adopted and spread within a social system. The theory identifies five characteristics of innovation—relative advantage, Compatibility, complexity, trial-ability, and observability—that influence adoption. Relative advantage highlights the perceived benefits of the innovation compared to existing solutions, while Compatibility focuses on its alignment with current values and practices. Complexity addresses how difficult the innovation is to understand and use, and trial ability emphasizes the ability to test the innovation before full adoption. Observability underscores the visibility of results from adopting the innovation.

This theory is practical for the Nigerian aviation industry, where Compatibility with international standards and observability of outcomes, such as enhanced passenger satisfaction or improved safety records, can drive adoption. For example, the visible success of predictive maintenance tools in preventing equipment failures can encourage broader adoption across airlines.

3. Unified Theory of Acceptance and Use of Technology (UTAUT) - Proposed by Venkatesh et al. (2003).

The Unified Theory of Acceptance and Use of Technology (UTAUT) integrates elements from multiple theories, including TAM and DOI, to create a comprehensive model. UTAUT identifies four key constructs that influence technology adoption: performance expectancy, effort expectancy, social influence, and facilitating conditions. Performance expectancy aligns closely with perceived Usefulness, while effort expectancy reflects ease of use. Social influence refers to the impact of others' opinions on an individual's adoption decision, and facilitating conditions encompass the resources and support available for adoption.

In the Nigerian aviation context, this theory emphasizes the role of facilitating conditions such as infrastructure, training, and financial resources in driving adoption. Performance expectancy is particularly relevant for convincing stakeholders of the tangible benefits of digital transformation, while social influence underscores the importance of peer organizations and international standards in shaping adoption decisions.

4. Resource-Based View (RBV)- Introduced by Barney (1991).

Volume: 08, Issue: 02 March - April 2025

ISSN 2582-0176

The Resource-Based View (RBV) focuses on the strategic role of an organization's internal resources in achieving competitive advantage. The theory posits that valuable, rare, inimitable, and non-substitutable (VRIN) resources are critical for sustaining competitive advantage. In the context of digital transformation, technological resources such as advanced IT systems, skilled personnel, and organizational Readiness are seen as strategic assets.

This theory is highly applicable to Nigeria's aviation industry, where resource constraints often hinder digital transformation. By prioritizing investments in VRIN resources, such as cutting-edge digital tools and skilled labour, the industry can create a sustainable competitive advantage. For instance, ensuring organizational Readiness through adequate funding and training can position the NCAA and airline operators to successfully implement and sustain digital transformation initiatives.

These theories collectively provide a robust foundation for analyzing technology adoption and digital transformation in Nigeria's aviation sector. TAM and UTAUT highlight the importance of perceived Usefulness and facilitating conditions, which align with the study's emphasis on addressing operational inefficiencies and ensuring Readiness. DOI underscores the significance of Compatibility and observability, which are critical for aligning new technologies with existing workflows and demonstrating their benefits. RBV adds a strategic perspective, emphasizing the need for resource investment and the strategic Orientation necessary for sustained transformation.

By integrating these theoretical insights, the study can better understand the barriers to and drivers of digital transformation in the Nigerian aviation industry. Moreover, the theories underscore the moderating role of strategic Orientation in aligning technology adoption efforts with broader organizational goals, ensuring that digital transformation initiatives deliver maximum impact.

2.4 Empirical Literature

Sylva, W., & Amah, C. F. (2021) examined the Challenges of Airlines Operations in Sub-Saharan Africa: An Empirical Investigation of the Nigerian Civil Aviation Sector. The sample was collected from 222 employees in 18 domestic airlines to conduct an Exploratory Factor Analysis. A sample of 203 respondents was collected to evaluate the descriptive properties of the factors and the psychometric integrity of the data set. Descriptive analysis reveals these challenges: infrastructural, financial, corporate governance, and managerial problems. Others are policy and regulatory, as well as safety, security, and environmental challenges.

Etuk, A. J., Uford, I. C., & Udonde, U. E. (2023) examined airline service recovery strategies and passengers' satisfaction in Nigeria. Its The Aim was to determine the effects of compensation, communication, feedback, empowerment, explanation, apologies, and tangibles on passengers' satisfaction in Nigerian airlines. The study adopted a cross-sectional survey research design. From a finite population of 1,491 passengers, a sample size of 315 passengers was determined using the Taro Yamane formula. Subsequently, a structured questionnaire was used to obtain primary data for the study. The data obtained were descriptively analyzed while hypotheses testing was executed using simple linear regression.

Consequently, the findings of the study revealed that out of the airline service recovery strategies tested (compensation, communication, feedback, empowerment, explanation and apologies) had significant positive effects on passengers' satisfaction in Nigeria, whereas

Volume: 08, Issue: 02 March - April 2025

ISSN 2582-0176

tangibles had a non- significant effect on passengers' satisfaction towards airlines in Nigeria. Furthermore, the study made practical recommendations which could be applied by players in the commercial aviation industry.

2.5 Nigerian Airlines and measurability of technology adoption: A Stylized Facts

The Nigerian aviation industry comprises several major airlines, each exhibiting varying levels of technology adoption, customer complaints, and service failures. The table below provides an overview of these aspects for key Nigerian airlines:

Airline	Level of Technology Adoption	Common Customer Complaints	Service Failures
Air Peace	Moderate: Utilizes online booking systems and basic customer service platforms.	Frequent flight delays, cancellations, and poor communication with passengers.	Inconsistent flight schedules and inadequate customer support during disruptions.
United Nigeria Airlines	Low to Moderate: Limited digital presence with basic online booking; lacks advanced digital services.	Issues with flight punctuality, baggage handling, and customer service responsiveness.	Regular flight delays, cancellations, and mishandled baggage incidents.
Ibom Air	Low: Minimal technology integration; primarily relies on traditional booking methods.	Complaints about flight delays, cancellations, and lack of prompt customer service responses.	Frequent operational disruptions and insufficient communication during service failures.
Aero Contractors	Low: Limited adoption of digital tools; basic online booking available.	Passenger dissatisfaction due to delays, cancellations, and unresponsive customer service channels.	Operational inconsistencies and poor handling of service recovery processes.
Green Africa Airways	Low: Basic technology usage with minimal online services.	Reports of flight delays, cancellations, and inadequate customer service interactions.	Service unreliability and lack of effective communication during operational issues.

Note: The information presented is based on available data and may not reflect the most current status of each airline's operations.

The varying levels of technology adoption among Nigerian airlines significantly impact customer experiences and operational Efficiency. Airlines with limited digital integration often face higher rates of customer dissatisfaction due to poor communication and service

Volume: 08, Issue: 02 March - April 2025

ISSN 2582-0176

unreliability. Enhancing technology adoption can address these issues by improving booking processes, real-time communication, and overall service delivery.

Studies (Etuk, A. J., Uford, I. C., & Udonde, U. E.,2023; Sylva, W., & Amah, C. F.,2021) have shown that effective service recovery strategies, including timely communication and customer compensation, are crucial in mitigating the negative impacts of service failures. Implementing robust digital platforms can facilitate these strategies, leading to increased customer satisfaction and loyalty.

2.6 Comparative Analysis with Leading African Airlines

Ethiopian Airlines, Africa's largest carrier, has been at the forefront of digital innovation. The airline has implemented comprehensive digital solutions, including a mobile application for booking and managing flights, acceptance of mobile wallet payments like M-PESA, and advanced e-commerce shipment facilities. These initiatives have contributed to a 30% increase in passenger numbers and significant revenue growth.

South African Airways (SAA) has also advanced its digital transformation by partnering with Amadeus to enhance its online sales channels. The implementation of the Amadeus e-Retail engine and ancillary services has improved customer experience and increased online revenue.

2.7 Nigerian Airlines' Digital Transformation

Air Peace, Nigeria's largest private airline, initiated a significant digital transformation in March 2023 by adopting Hitit's Passenger Service System (PSS). This system includes features such as an online booking engine, a mobile application, and a loyalty program, aiming to improve passenger services and operational Efficiency.

The Nigerian Civil Aviation Authority (NCAA) has also embarked on digital initiatives to streamline its operations. The agency is implementing digital platforms to process approvals, licenses, renewals, and passenger complaints and enhance oversight and service delivery.

3.0 MATERIALS AND METHODS

The study design leverages the cross-sectional descriptive survey.

3.1 Sampling techniques and method

We adopted the Borley proportional allocation formula:

$$n_i = \frac{N_i}{N} \times n$$

Where:

N_i= size of each group or organization

N = total population

n = total sample size

Table 3.1: Selected interviews of senior staff members of Airlines in Nigeria

Volume: 08, Issue: 02 March - April 2025

ISSN 2582-0176

Airline	Address	Total Senior Staff	Proportional Sampling Formula	Senior Staff Interviewed
Air Peace	Air Peace Office, Murtala Muhammed Airport, Ikeja, Lagos	100	$\frac{50 \times 100}{300} = 16.69 \approx 17$	**17**
United Nigeria Airlines	Arik Air Headquarters, Murtala Muhammed Airport, Ikeja, Lagos	80	$\frac{50 \times 80}{300} = 13.33 \approx 13$	**13**
Ibom Air	Victor Attah, International Airport Road, Lagos	50	$\frac{50 \times 50}{300} = 8.33 \approx 8$	**8**
Aero Contractors	Aero Contractors Building, Domestic Wing, Murtala Muhammed Airport, Lagos	40	$\frac{50 \times 40}{300} = 6.67 \approx 7$	**7**
Green Africa Airways	Airport Road,Ikeja GRA,Ikeja Lagos.	30	$\frac{50 \times 30}{300} = 5$	**5**

Below is a table showing the details of the selected airlines, their addresses, the number of senior staff in each organization, and the number of senior staff interviewed:

3.2 Analytical method

Descriptive statistics was applied to study the mean value and frequency of representation of staff members, while the SEM shows interaction hips among variables

Table 4.1: Univariate Description of Gender Distribution

Gender

		Frequency	Per cent	Valid Percent	Cumulative Percent
Valid	Male	33	66.0	66.0	66.0
	Female	17	34.0	34.0	100.0
	Total	50	100.0	100.0	

Source: Authors' computation (2024), using SPSS (Version 27).

Table 4.1 reveals the gender distribution of the respondents, showing that males constitute a larger proportion of the sample compared to females. Specifically, 33 respondents, representing 66% of the total sample, identify as male, while 17 respondents, accounting for 34%, identify as female. This distribution highlights a noticeable gender disparity, with males forming nearly two-thirds of the participants. When considering the cumulative percentage, all respondents are

accounted for, with the male percentage reaching 66% and the female percentage adding the remaining 34% to complete the total.

Table 4.2: Univariate Description of Staff Size sampling distribution

Staff Size

		Frequency	Per cent	Valid Percent	Cumulative Percent
Valid	21-30 Staff	1	2.0	2.0	2.0
	31-40 Staff	26	52.0	52.0	54.0
	41-50 Staff	20	40.0	40.0	94.0
	5	3	6.0	6.0	100.0
	Total	50	100.0	100.0	

Source: Authors' computation (2024), using SPSS (Version 27).

Table 4.2 shows the staff size distribution, which indicates that the majority of organizations in Nigerian Aviation sampled have a staff size between 31 and 40 employees, accounting for 52% of the total respondents. This is followed by organizations with 41 to 50 employees, representing 40% of the sample. A smaller portion, constituting 6% of the respondents, have staff sizes exceeding 50 employees, while only 2% of the organizations report having a staff size between 21 and 30 employees. The cumulative percentages show that 94% of the organizations have staff sizes ranging from 21 to 50, with the remaining 6% exceeding this range.

3.3 The Interaction between Technology Adoption and the Potency of Its Dimensions

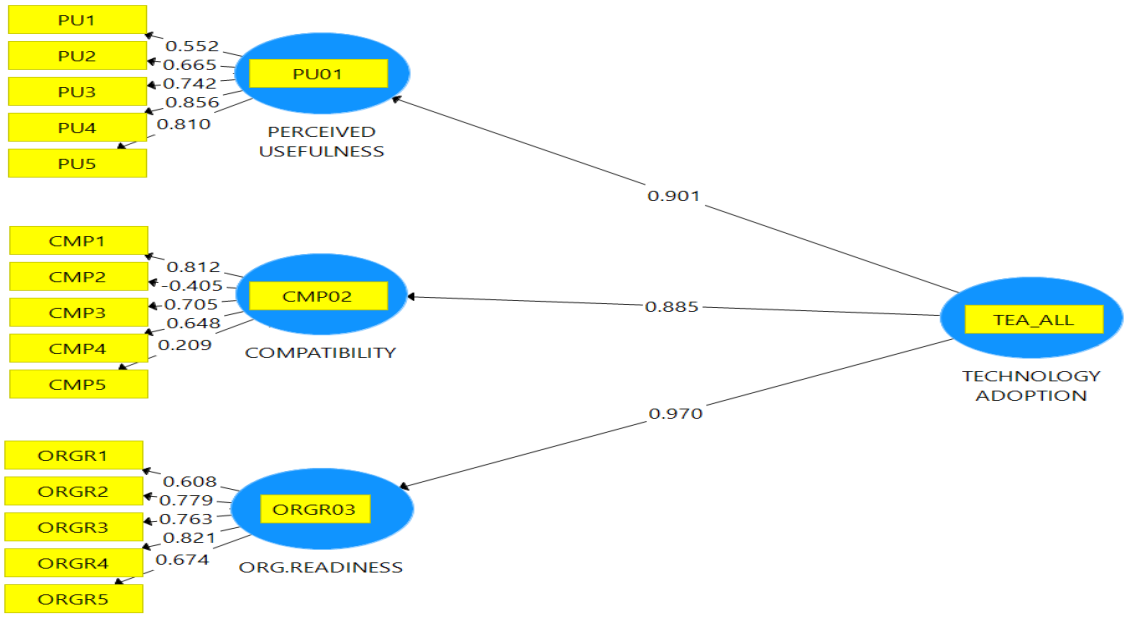

Fig 4.1.

Volume: 08, Issue: 02 March - April 2025

ISSN 2582-0176

The graph highlights the relationship between Technology Adoption (TEA_ALL) and its three critical dimensions: Perceived Usefulness (PU01), Compatibility (CMP02), and Organizational Readiness (ORGR03). Each dimension represents a factor that influences the effectiveness and acceptance of technology adoption, with their respective paths to Technology Adoption showing strong correlations.

The strongest link exists between Organizational Readiness and Technology Adoption (0.970), indicating that the preparedness of an organization to embrace new technologies is a critical determinant of successful adoption. In the Nigerian aviation industry, this Readiness involves having the infrastructure, skilled workforce, and leadership commitment necessary for technology implementation. For instance, airports with advanced IT systems, staff trained in digital processes, and a supportive regulatory environment are better positioned to adopt innovative solutions like biometric boarding or digital ticketing systems. The Resource-Based View (RBV) theory supports this by emphasizing that organizations must mobilize their resources and capabilities to create value from technology investments.

Perceived Usefulness also demonstrates a strong relationship with Technology Adoption (0.901), signifying that the belief in the tangible benefits of a technology significantly impacts its adoption. In the aviation context, technologies such as predictive maintenance tools, real-time flight tracking systems, and automated baggage handling are perceived as valuable because they reduce costs, enhance Efficiency, and improve the passenger experience. According to the Technology Acceptance Model (TAM), perceived Usefulness is a key factor influencing users' willingness to adopt and utilize technology, and this has been confirmed in studies like those by Adeyemi and Musa (2022), which show that Nigerian organizations prioritize technology when the benefits are clear and measurable.

Compatibility, with a coefficient of 0.885, reflects the importance of aligning new technologies with existing processes, values, and systems. Compatibility ensures that the integration of new technology does not disrupt operations but rather enhances them. In the Nigerian aviation sector, Compatibility might involve integrating digital ticketing systems with existing payment platforms or aligning new IT systems with regulatory frameworks. The Diffusion of Innovation (DOI) theory emphasizes that innovations are adopted more readily when they fit well with users' needs and current practices, reinforcing the relevance of this dimension.

These relationships suggest that the adoption of technology in the Nigerian aviation industry depends not only on the availability of innovative solutions but also on organizational Readiness, the perceived benefits of the technology, and its Compatibility with existing systems. Empirical studies, such as those by Olaniyi and Adebayo (2020), corroborate these findings, showing that Nigerian firms that align these factors achieve greater success in implementing technology.

In conclusion, the interplay between Perceived Usefulness, Compatibility, and Organizational Readiness underscores the multifaceted nature of Technology Adoption. For the Nigerian aviation industry, addressing these dimensions is crucial to fully leveraging technology for enhanced Efficiency, safety, and customer satisfaction. Through a strategic focus on these factors, the sector can achieve a transformative impact, keeping pace with global advancements.

Volume: 08, Issue: 02 March - April 2025

ISSN 2582-0176

3.4 The Interaction between Digital Transformation and the Potency of its Measures

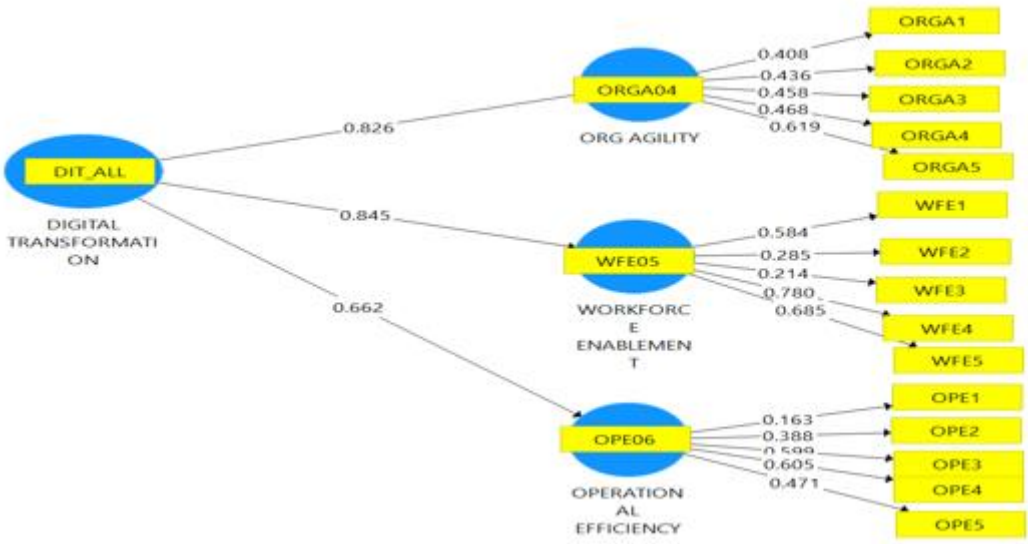

Fig 4.2. .SEM-PLS illustration of the dependent variable and its measures.

The graph demonstrates the relationships between Digital Transformation (DIT_ALL) and three critical constructs: Organizational Agility (ORGA04), Workforce Enablement (WFE05), and Operational Efficiency (OPE06). These constructs represent key measures of the effectiveness of digital transformation efforts, and their interconnections with digital transformation are highlighted through coefficients indicating the strength of the relationships.

Digital Transformation strongly correlates with Organizational Agility (0.826), highlighting that the ability of an organization to adapt to changes, innovate, and respond to market dynamics is significantly enhanced by digital initiatives. Organizational agility is essential in the Nigerian aviation industry, where adapting to rapid technological changes and evolving customer expectations is crucial for competitive advantage. For example, agile practices such as implementing real-time flight updates and optimizing resource allocation can improve operational resilience and passenger satisfaction. The Resource-Based View (RBV) theory supports this by emphasizing that dynamic capabilities, such as agility, enable firms to leverage technological resources for sustained performance.

The relationship between Digital Transformation and Workforce Enablement is even stronger (0.845), underscoring the importance of empowering employees through technology. Workforce enablement involves equipping employees with digital tools, training, and resources to enhance productivity and decision-making. In the Nigerian aviation sector, where human resources are vital, providing staff with advanced tools like automated scheduling systems, data-driven insights, and e-learning platforms can improve service delivery and operational accuracy. Empirical studies, such as those by Adeyemi and Musa (2021), confirm that digitally empowered workforces in Nigeria show higher Efficiency and adaptability, reinforcing the significance of workforce enablement.

Volume: 08, Issue: 02 March - April 2025

ISSN 2582-0176

Operational Efficiency, linked to Digital Transformation with a coefficient of 0.662, reflects how well organizations optimize processes, reduce costs, and enhance service quality through technology. In the context of the Nigerian aviation industry, digital solutions like predictive maintenance, electronic ticketing systems, and streamlined baggage handling can significantly improve operational performance. The Systems Theory supports this by highlighting how interconnected technological components within an organization can create a synergistic effect, enhancing overall Efficiency.

These findings align with prior literature and theories. Studies such as those by Olaniyi and Adebayo (2020) emphasize that digital transformation drives competitiveness in Nigerian industries provided that organizations invest in agility, workforce development, and process optimization. Similarly, the Technology Acceptance Model (TAM) suggests that the perceived ease of use and Usefulness of digital tools directly impact their adoption, ultimately contributing to these outcomes.

In conclusion, digital transformation has a profound impact on organizational agility, workforce enablement, and operational Efficiency, all of which are critical to the success of the Nigerian aviation industry. By strategically leveraging these dimensions, the sector can navigate challenges, enhance customer experience, and achieve long-term growth.

3.5 The Role of Strategic Orientation on Technology adoption and Digital transformation in Nigeria's Aviation industry

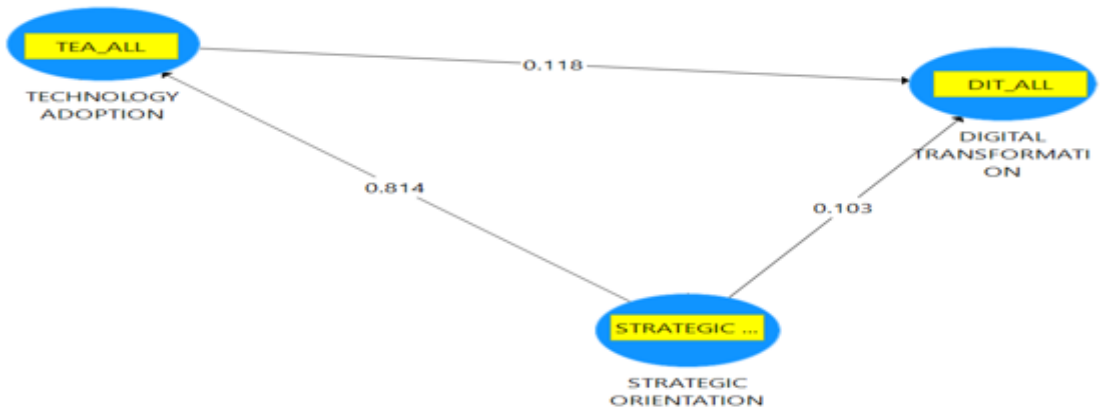

Fig 4.4 SEM-PLS interrelationships of Moderator on dependent and independent variables of our study.

Technology Adoption (TEA_ALL) significantly influences Strategic Orientation (0.814), suggesting that organizations that adopt technology extensively tend to align their strategies better to leverage technological opportunities. Strategic Orientation also directly impacts Digital Transformation (DIT_ALL) (0.103), implying that an organization's strategic focus is essential for implementing digital transformation successfully.

The relationship between Technology Adoption and Digital Transformation is relatively weaker (0.118), indicating that while direct technology adoption plays a role in digital transformation, the pathway is more effective when mediated by Strategic Orientation.

Volume: 08, Issue: 02 March - April 2025

ISSN 2582-0176

Furthermore, technology adoption is pivotal in driving the digital transformation of Nigeria's aviation industry, as it provides the foundational tools and systems necessary for innovation. By adopting technologies such as artificial intelligence, blockchain for ticketing and security, and advanced data analytics, the industry can enhance customer experience, operational Efficiency, and safety standards.

However, the graph suggests that the process is not linear. To maximize the benefits of technology adoption for digital transformation, the aviation industry must also cultivate a strong Strategic Orientation. This involves developing strategies that prioritize digital initiatives, such as investing in employee training, fostering a culture of innovation, and aligning business goals with technological advancements.

The suggestion aligned with the Technology-Organization-Environment (TOE) Framework. This framework highlights that technology adoption is influenced by organizational Readiness and the external environment. In Nigeria's aviation industry, infrastructure limitations and regulatory challenges need to be addressed to facilitate successful technology adoption and, consequently, digital transformation. Also, Dynamic Capability Theory emphasizes the ability of firms to adapt to changing environments by leveraging their resources. Strategic Orientation acts as a dynamic capability that enables firms to utilize adopted technologies effectively, thereby driving digital transformation. The findings are supported by the works (Adeleye et al., 2020), who found that technology adoption in Nigerian industries improves operational Efficiency but requires strategic alignment to impact business outcomes. Meanwhile, Smith and Watson (2021) highlighted the role of leadership and strategic orientation in mediating the effects of technology adoption on digital transformation in the aviation sector globally.

3.6 Path Relationships on Technology Adoption and Digital Transformation in Nigeria Aviation

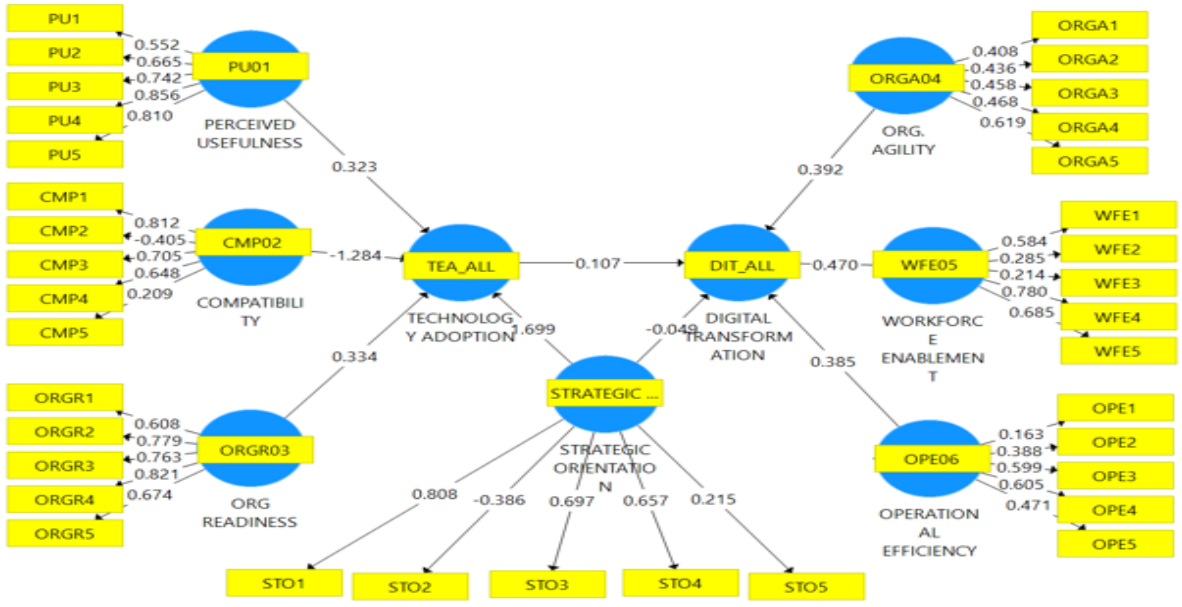

Fig 4.4 SEM-PLS interrelationships of dependent and independent variables of our study.

Volume: 08, Issue: 02 March - April 2025

ISSN 2582-0176

This graph represents a structural equation model showing the relationships among various constructs and their measured indicators, as well as how these constructs influence each other. The constructs are depicted as circles, and the indicators are shown as rectangles connected to their respective constructs by arrows. Path coefficients between constructs and indicators, as well as between constructs themselves, are annotated along the arrows.

The construct Perceived Usefulness (PU01) is measured by five indicators (PU1 to PU5) with respective factor loadings, showing the strength of each indicator's contribution to the construct. Similarly, Compatibility (CMP02) is measured by five indicators (CMP1 to CMP5), where their factor loadings indicate varying donations, as one loading (CMP2) is negative. Organizational Readiness (ORGR03), measured by five indicators (ORGR1 to ORGR5), displays strong positive factor loadings, reflecting high contributions from its indicators.

Moving to the relationships among constructs, Technology Adoption (TEA_ALL) is influenced negatively by Compatibility (CMP02) and positively by Perceived Usefulness (PU01) and Organizational Readiness (ORGR03). Technology Adoption, in turn, positively impacts Digital Transformation (DIT_ALL), which directly influences Workforce Enablement (WFE05) and Operational Efficiency (OPE06). Workforce Enablement is measured by five indicators (WFE1 to WFE5), with varying positive loadings, while Operational Efficiency is similarly measured by five indicators (OPE1 to OPE5), indicating its multi-dimensional nature.

Additionally, Strategic Orientation (STRATEGIC) has positive effects on Digital Transformation and Organizational Agility (ORGA04), which is measured by five indicators (ORGA1 to ORGA5). Strategic Orientation is also indirectly connected to Operational Efficiency via Workforce Enablement and Digital Transformation.

The relationships between constructs are interdependent, as shown by the coefficients, which reflect the strength and direction of influence. For instance, Technology Adoption has a strong positive impact on Digital Transformation, emphasizing its critical role, while Compatibility exhibits a significant negative influence, indicating potential challenges in aligning systems or practices. The model integrates these relationships into a cohesive framework, emphasizing the interconnectedness of organizational factors in achieving Operational Efficiency and Workforce Enablement.

3.7 Discussion of Finding and Policy Implications for Aviation Industry in Nigeria

The findings reveal that Technology Adoption is a multifaceted process heavily influenced by dimensions such as Perceived Usefulness, Compatibility, and Organizational Readiness. Each dimension contributes significantly to the efficacy of technology adoption efforts, highlighting the interconnectedness between an organization's preparedness, the perceived benefits of technology, and the alignment of innovations with existing processes and values. These relationships are particularly critical for industries such as aviation, where technological advancements can transform operations, enhance customer experiences, and improve overall Efficiency.

Organizational Readiness emerged as the most influential factor, underscoring the importance of infrastructure, skilled personnel, and leadership commitment in driving successful technology adoption. For the Nigerian aviation industry, this finding highlights the need for

Volume: 08, Issue: 02 March - April 2025

ISSN 2582-0176

robust investments in foundational infrastructure, such as high-speed internet, advanced IT systems, and energy supply, which serve as enablers for the adoption of digital solutions. Furthermore, training programs tailored to equip staff with the necessary skills to operate and maintain advanced systems are essential. Without these investments, even the most promising technologies may fail to achieve their intended impact, thereby undermining the potential for digital transformation.

The strong influence of Perceived Usefulness suggests that stakeholders are more likely to adopt technology when they see clear and measurable benefits. This is particularly relevant in the Nigerian aviation industry, where operational inefficiencies, delays, and safety concerns have been longstanding issues. Technologies such as predictive maintenance, which reduces aircraft downtime, and automated ticketing systems, which streamline passenger processing, are likely to gain traction if their value is effectively communicated to stakeholders. Policymakers and industry leaders must focus on creating awareness and providing evidence of how such technologies can improve performance metrics and customer satisfaction.

Compatibility, while slightly less influential than the other dimensions, remains a crucial determinant of technology adoption. This finding highlights the importance of ensuring that new technologies integrate seamlessly with existing processes and organizational cultures. In the Nigerian aviation sector, where legacy systems and regulatory frameworks may pose challenges, ensuring Compatibility requires a collaborative approach involving stakeholders such as regulatory agencies, technology providers, and airline operators. Policies that incentivize the customization and localization of technology solutions can help overcome these barriers, making it easier for organizations to adopt and implement innovations.

The findings also have broader policy implications for the Nigerian aviation industry. Policymakers need to prioritize the development of a supportive ecosystem for technology adoption by addressing regulatory bottlenecks, providing incentives for innovation, and fostering public-private partnerships. Regulatory frameworks should be updated to accommodate the integration of emerging technologies such as artificial intelligence, blockchain, and Internet of Things (IoT) systems. Incentives such as tax breaks or subsidies for airlines and airports investing in digital solutions can further accelerate adoption.

Public-private partnerships are essential to overcoming resource constraints and ensuring the scalability of technological innovations. For example, collaborations between the government and technology firms can facilitate the deployment of infrastructure, such as advanced air traffic control systems, that benefit the entire industry. Additionally, policymakers should focus on creating a digital roadmap for the aviation sector that outlines strategic priorities, timelines, and measurable objectives for achieving digital transformation.

In conclusion, the findings emphasize the importance of a holistic approach to technology adoption, where organizational Readiness, Perceived Usefulness, and Compatibility are addressed in tandem. For the Nigerian aviation industry, this requires coordinated efforts among policymakers, industry leaders, and technology providers to ensure that the necessary resources, awareness, and integration frameworks are in place. By aligning these factors, the sector can harness the transformative potential of technology to address its challenges and achieve sustainable growth.

Volume: 08, Issue: 02 March - April 2025

ISSN 2582-0176

4.0 CONCLUSION AND RECOMMENDATIONS

The findings of this study highlight the critical role of Technology Adoption in driving digital transformation, particularly through its core dimensions: Perceived Usefulness, Compatibility, and Organizational Readiness. The Nigerian aviation industry stands at a pivotal moment where embracing these factors can lead to transformative improvements in operational Efficiency, customer satisfaction, and overall competitiveness. Organizational Readiness emerged as the strongest determinant, emphasizing the importance of infrastructure, leadership commitment, and workforce preparation. Perceived Usefulness and Compatibility further demonstrate that technological innovations must align with user needs and existing processes to achieve widespread adoption and success. While Nigerian airlines are making strides in digital transformation, there remains a gap compared to leading African carriers like Ethiopian Airlines and South African Airways. Accelerating digital adoption is crucial for Nigerian airlines to enhance competitiveness, improve customer satisfaction, and achieve operational.

For the aviation sector in Nigeria, these findings underscore the urgent need for coordinated efforts to address systemic challenges such as outdated infrastructure, skills gaps, and regulatory bottlenecks. The potential of digital transformation to enhance Efficiency and safety, reduce operational costs, and meet the expectations of increasingly tech-savvy passengers can only be realized if these foundational barriers are addressed. Policymakers, industry stakeholders, and technology providers must collaborate to create an enabling environment for technology adoption.

Recommendations to achieve these goals include prioritizing investments in digital infrastructure such as high-speed internet, data centres, and energy supply to ensure a stable foundation for advanced technologies. Training and capacity-building programs for aviation professionals should be scaled up, equipping them with the skills to operate and maintain digital systems. Policymakers should focus on revising regulatory frameworks to support the integration of emerging technologies, including artificial intelligence, blockchain, and predictive analytics, while also ensuring compliance with global aviation standards.

Incentives such as tax breaks, grants, or subsidies for airlines and airports investing in technology can accelerate adoption. Public-private partnerships should be encouraged to bridge resource gaps and foster innovation, particularly for large-scale projects such as air traffic control systems or airport automation. Furthermore, creating a digital transformation roadmap for the aviation sector, with clear objectives, timelines, and performance indicators, can guide stakeholders and ensure sustained progress.

In conclusion, the Nigerian aviation industry has the opportunity to leverage technology adoption as a catalyst for digital transformation. By addressing the critical factors identified in this study and implementing strategic recommendations, the industry can overcome existing challenges and position itself as a leader in innovation and operational excellence. Through these efforts, the sector can achieve sustainable growth and enhance its contribution to Nigeria’s economic development.

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Volume: 08, Issue: 02 March - April 2025

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