Digital Transformation Strategies and Operational Performance of Port Harcourt Int'l Airport, Port Harcourt, Rivers State, Nigeria

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Abstract

The study investigated relationship between digital transformation strategies and operational performance of Port Harcourt Int'l Airport, Port Harcourt. The research design for the study was correlational. The study operationalized the digital transformation strategies into strategies of Artificial Intelligence and Internet of Everything and weighed in the measures of operational performance of the airlines. The population of the study was 145 which consisted of staff of Dana Air, Ibom Air, Arik Airline, and Air Peace operating at the Port Harcourt International Airport, Rivers State, Nigeria. It adopted the census sampling technique which involved studying the entire population. Out of 145 sampled respondents, 130 representing 87% of the total administered questionnaire were returned. The study used the returned 130 for its analysis. The questionnaire was validated by a Senior Lecturer in the Department of Measurement and Evaluation, Niger Delta University, Bayelsa State, Nigeria. The reliability test of the study was tested using Crombach Alpha and showed .98>.71 which implied high reliability of the questionnaire instrument used. The research questions were answered using Mean and Standard Deviation (descriptive statistics) at mean benchmark of 2.5, while the null hypotheses were tested using Pearson Product Correlation Coefficient at .05 significance level. The findings of the study showed a significant relationship between digital transformation strategies and operational performance of public sector, a study of Port Harcourt Int'l Airport, Port Harcourt. It concluded that that listed airlines in the Port Harcourt International Airport have understanding or availability of Artificial Intelligence but that it does not reflect on their information strategies in the use of internet of Everything. That customers are not aware of changes within reasonable period of time. The airlines investigated do not have the time consciousness of its customers by relating information of travel of importance to such passengers as early as possible. The study recommended that management should upgrade its Artificial Intelligence facilities to be prompt in informing passengers on any travel changes, including flight cancellation. And to train and retrain staff, possibly over-seas, on the use of information high way or internet in management information of passengers in the listed airlines.

***Keywords:** Digital Information Strategies, Port Harcourt, Intl Airport, Time, Passenger, Operational Performance.*

Introduction

Technological transformation has strategically altered the organizational processes of doing things for greater market presence and profitability or service delivery. Clients, vendors, travellers, other stakeholders in public service, with special mention of Port Harcourt International Airport is today expected to exercise quick dispatch of services. Digital transformation is here to foster a new or emerging culture of operational performance. Digital transformation entails the use of artificial intelligence, Internet of Everything (IOE), cloud computing and document processing digital devices (Nweke, 2024). This study contemplates the use of technologies in smoothening the organizational performance of Port Harcourt International Airport.

The study views organizational performance of Port Harcourt International Airport in the light of customer service experience, prompt information on flight cancellation, rescheduling marketing and flight timing. Adiora (2017) argued that operational efficiency recorded on the accounts of customers' experience, marketing reach and level of repeat purchase by clients. This implies that customer experience that is augured with the use of technologies would trickle down the other stakeholders who have affiliations with the organization. Organizational operational performance measures the level of attainment of organization's set goals. It measures the outcome of invested resources in terms of men, materials and other production agents. Effective organizational operation indices according to Ikonne (2021), shows in financial performance, operational performance, stakeholders returns performance, and market performance. Joan (2024) reaffirmed that organizational operations is the measure of how well an organization keeps to its own set standards by comparing actual results to intended outputs. It encompasses various components, including financial performance, operational efficiency, market position, and shareholder value. Professionals evaluate performance to assess progress, justify resource allocation, and make strategic changes for improvement. The use of digital technologies or transformation in garnering resources to surmount progress blockades in any organization serves as a major leeway to contemporary rating of any organization. Organization performance links with digital transformation as major performance indices are in the contemporary times, digital oriented and any organization worth its onions may only succeed by adopting the most appropriate technologies.

The idea of digital transformation, which refers to both an organisational process and activities related to the information technology sector, has its roots in the middle of the twentieth century. The rise and steady improvement of early computing technologies, along with the shift from analogue systems to digitally encoded information, were major turning points in the growth of technology and industry. The term "digitisation," which was first used in 1954, usually means changing analogue information into digital representations (Boratyńska, 2019). In this case, information is shown as binary numbers, specifically the numbers "0" and "1." These numbers let computers store, process, and send data quickly and easily. Digitisation, in a general sense, means turning analogue activities into processes that can be done digitally. This is usually done by adding information technologies to the way an organization already does things. This integration of technology makes existing procedures work better, makes it easier to carry out operations, and often leads to lower costs (Verhoef et al., 2019; Khanra et al., 2020). Moreover, the digitisation of information can instigate extensive organisational transformations, including alterations to current business models, thereby allowing companies to create greater value for all stakeholders engaged in the business process (Heilig et al., 2017).

There have been studies on digital transformation especially as it affects organizational growth and operational efficiency. Studies by Jimoh (2019), Kce (2019) all indicate that there has been studies around digital transformation and organizational efficiency but there has not been any study around organizational performance as it affects public service in Nigeria. This study is therefore geared towards bridging the gap.

Statement of Problems

Digital transformation is an entirely electronic activity that is geared towards aiding or facilitating organizational processes to achieve set goals. Such facilitations are expected to result to improved operational performance of such organizations as Port Harcourt International Airport. However, it has been observed that most public service in Port Harcourt International Airport has shown unclear technological strategies in their adoption and implementation of digital transformation. A case in point is the impromptu-ness in the cancellation of flights and rescheduling. It is also worrisome that public organizations have not shown sufficient effort in the use of internet in improving its marketing space or stake holders' information about its activities. The use of Artificial Intelligence (AI) in its operations such as messaging, information strategy has not been in notice. The study will therefore investigate the relationship between digital transformation and organizational performance in public service sector in Rivers State, Nigeria.

Conceptual Framework

Digital Transformation

Artificial Intelligence

Internet of Everything
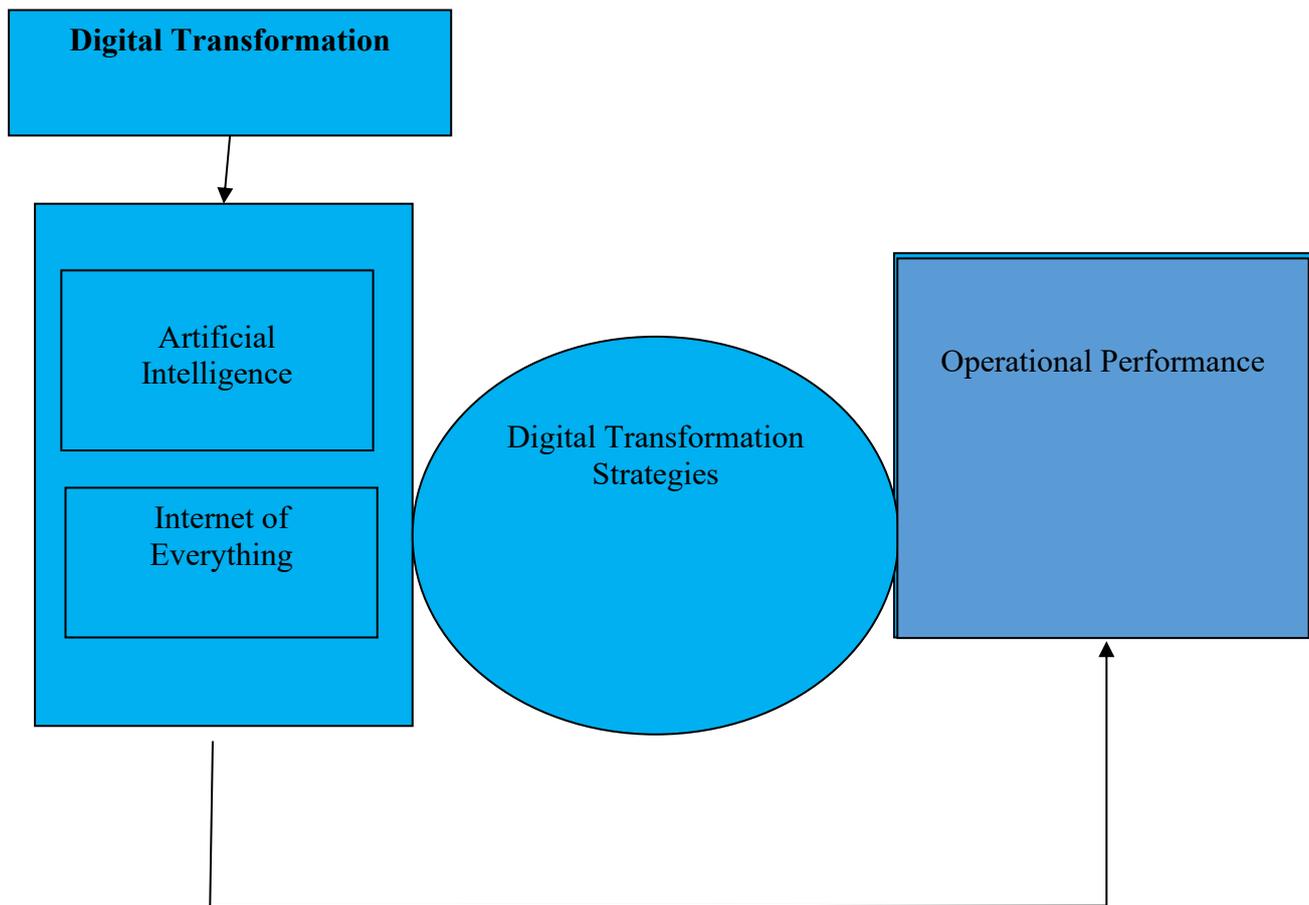
Digital Transformation Strategies

Operational Performance

Aim and Objectives of the Research

The of the study is to determine the relationship between digital transformation strategies and operational performance of public sector, a study of Port Harcourt Int'l Airport, Port Harcourt, Nigeria; with the following specific objectives:

1. To investigate the relationship between Artificial Intelligence and operational performance in the Port Harcourt International Airport.
2. To find out the relationship between internet of everything and operational performance in the Port Harcourt International Airport

Research Questions

The following research questions guided the study:

1. To what extent does Artificial Intelligence relate with operational performance in the Port Harcourt International Airport?
2. To what extent does internet of everything relate with operational performance in the Port Harcourt International Airport?

Hypotheses

The following null hypotheses guided the study:

1. There is no significant relationship between Artificial Intelligence and operational performance in the Port Harcourt International Airport
2. There is no significant relationship between internet of everything and operational performance in the Port Harcourt International Airport

Literature Review

Theoretical Foundation
The Resource-Based View Theory

The study is based on the Resource-Based View (RBV) of the organization, which is a key idea in strategic management that stresses how important internal resources are for getting and keeping a competitive edge. The RBV, which Wernerfelt (1984) first suggested and Barney (1991) later built on, says that a company's resources and abilities are the most important factors in its strategic success. This perspective is different from external market-based viewpoints like Porter's Five Forces because it focuses on the company's unique assets. There are two fundamental ideas behind the RBV: resource heterogeneity and resource immobility. Resource heterogeneity means that companies have different sets of resources that set them apart from their competitors. Resource immobility indicates that these resources are not readily transferable or replicated by other

enterprises, hence constituting a source of enduring competitive advantage (Barney, 1991).

This investigation required the theory due to the significance of information systems resources in contemporary society. The Resource-Based View of the firm is a useful way to think about how a company's internal resources provide it an edge over its competitors. RBV has become a key part of strategic management theory by stressing how important it is to have distinctive, valuable, and hard-to-copy resources.

Digital Transformation

Digital transformation is now a part of almost every part of modern life, including the aviation industry, where technology is becoming more and more important in how operations and services are delivered. Wang et al. (2022) note that digital transformation is fundamentally changing how businesses work by changing their internal processes and the ways they develop and distribute value to customers. This change is mostly caused by the growth and spread of digital technologies. It changes how people and businesses connect with each other and affects how organisations work in many different fields. Nonetheless, although technology infrastructure serves as the fundamental foundation for digital transformation, it is insufficient by itself to guarantee its successful implementation. Human capital, organisational culture, and leadership commitment are all equally important for making and keeping transformative change. External factors, like changing customer expectations, investor demands, and the quest for greater economic and social benefits, also drive digital transformation (Yinga, 2017). In this environment, digital transformation offers organisations substantial chances to restructure their business models, market engagement strategies, organisational frameworks, and operational processes. In the aviation industry, using digital technologies to meet the needs of air travelers—especially when it comes to service efficiency, timeliness, and the overall customer experience—has become a key way for airlines to improve customer satisfaction and get more referrals. This is the main focus of this study.

Concept of Airport Operational Performance

Hassan, Adegbayi, Olabosinde & Samuel (2023) defined airport operations to include customer satisfaction from flight booking, boarding and landing. The information and speed with which such information gets to the customer is very critical to assessing the operational performance of any airline. The study identified flight cancellation, rescheduling, marketing and waiting time areas airlines operating in Port Harcourt International Airport may strategies in ensuring quality or effective operational performance. Flight delays are a common issue in the aviation industry, affecting both airlines and passengers. Delays can lead to increased operational costs for airlines (Ball et al., 2010), missed connections for passengers, and overall dissatisfaction with air travel (Kim and Park, 2016). A key metric to measure the performance of airlines and airports is the On-Time Performance (OTP), defined as the percentage of flights that depart or arrive within 15 minutes of their scheduled time. Similarly, a flight is said to respect its OTP criterion if it departs or arrives within 15 minutes of the scheduled time. OTP is a critical factor in customer satisfaction and choice, with customers being willing to pay a premium to reduce the likelihood of delays (Yimga, 2017). The diagram below shows the study's priority or measurements on the airline operations performance: It interprets that passengers time be saved, satisfied customers may make referrals which in turn becomes a marketing strategy. The study philosophizes that one operational performance of airlines in Port Harcourt International airport is satisfactory to passengers (customers), referrals would be made, thereby making effective operational performance, a marketing strategy.
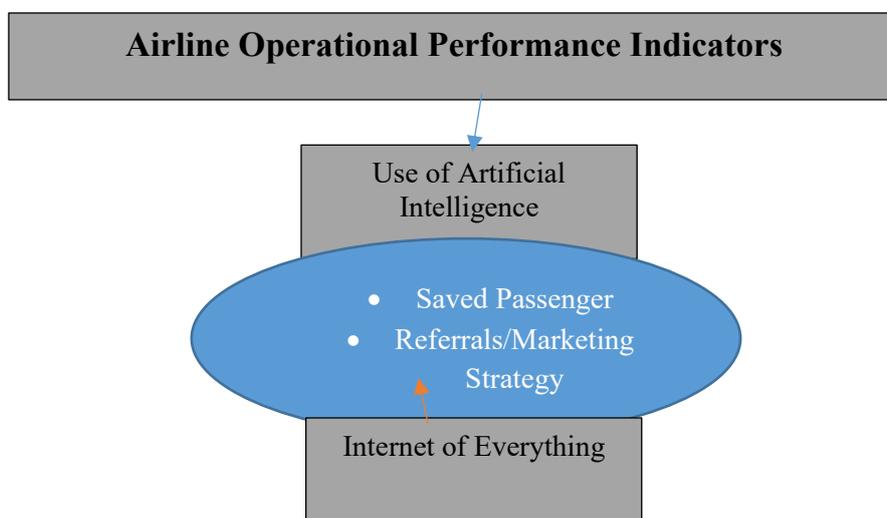

Fig 1: Researchers' Airline Operational Performance Indicators, 2026

Artificial Intelligence and Operational Performance in Airports

Artificial Intelligence (AI) is often defined as the replication or emulation of human cognitive functions in computer systems engineered to execute activities that typically necessitate human thinking, learning, and problem-solving skills (Nweke, 2023). In this way, AI lets computers look at large datasets, find patterns, make smart choices, and keep adapting to new knowledge with little or no help from people (Andre, Frank, & Terry, 2019). The use of AI-driven technology is becoming more and more important for managing airports and running aviation operations. These systems help make operations more efficient, improve security, and give passengers a better experience. Airports Council International (ACI, 2023) says that the rapid growth of air traffic around the world has made modern airports much more complicated to run. They are now huge, interconnected hubs that have to handle many tasks at once, such as processing passengers, screening for security, coordinating air traffic, and handling luggage, all while sticking to strict turnaround schedules. As a result, the aviation sector is spending a lot of money on cutting-edge technologies like biometric identification systems, automated passenger check-in platforms, and real-time flight data analytics to streamline operations and make airport services more efficient overall.

Internet of Everything and Operational Performance of Airports

The Internet of Everything (IoE) is a step forward in both ideas and technology from the Internet of Things (IoT). It is an interconnected ecosystem that connects devices, people, processes, and data into a single digital space that can improve communication, coordination, and operational efficiency across many fields (Nweke, 2024). In this context, technology makes it easier for people and intelligent systems to work together, which makes operations run more smoothly and without interruptions. In the aviation industry, where being on time and doing things right are very important, delays can have big effects on airlines and airport authorities' finances and operations. As a result, the use of IoE-driven technologies could improve operational coordination, cut down on waste, and add value for airlines. This would not only be an operational improvement, but it would also give airlines a strategic marketing edge in the highly competitive aviation industry (Adiele, 2023).

The boarding process is one of the most important parts of airport management since it helps keep flights on time and cuts down on delays. Over the years, boarding efficiency has changed a lot. For example, the average speed of boarding went from around nine passengers per minute in the late 1970s to almost twenty passengers per minute in the early 2000s (Adiele, 2023). Even with this development, there are still chances to make things even better by redesigning processes and using technology better. As a result, research in aviation operations has focused more and more on things like planning airport resources in environments where capacity is limited, optimising schedules based on the number of passengers and aircraft arrivals, and using simulation techniques to cut down on passenger wait times and improve the flow of operations in airport terminals.

Grant (1991) says that shortening the time it takes to board a plane is good for airlines, airport operators, and passengers since it makes operations more efficient and makes the whole travel experience better. Because aviation systems produce a lot of data, using Industry 4.0 technologies like interconnected devices, wireless machine-to-machine communication, and advanced data analytics might greatly improve operations. In this regard, the idea of "Boarding 4.0" has been put up as a technologically advanced boarding system based on IoT-enabled infrastructure (Fix, 2018). The approach aims to modernise traditional boarding operations by allowing airlines to keep up with new technologies, speed up the processing of passengers, and improve service delivery. The Boarding 4.0 framework can make boarding operations more efficient, which will help passengers make better use of their waiting time and also make airline and airport systems run better. A comparative comparison of traditional boarding methods and the Boarding 4.0 model demonstrates how technology-driven processes can rectify operational inefficiencies and alleviate issues associated with conventional boarding procedures (Adiele, 2023).

Methodology

The study utilised a correlational research design. The study population comprised 145 individuals, including employees from Dana Air, Ibom Air, Arik Airline, and Air Peace, all operating at Port Harcourt International Airport, Rivers State, Nigeria. It used the census sample method, which meant looking at the whole population. Out of 145 people who were asked to fill out the questionnaire, 130, or 87% of the total, sent it back. The study utilised the returned 130 for its analysis. A Senior Lecturer in the Department of Measurement and Evaluation at Niger Delta University in Bayelsa State, Nigeria, checked the questionnaire for accuracy. The study's reliability test, conducted with Crombach Alpha, yielded a result of .98>.71, indicating a high level of reliability for the questionnaire instrument employed. The study issues were addressed utilising Mean and Standard Deviation (descriptive statistics) with a mean benchmark of 2.5, whereas the null hypotheses were evaluated utilising the Pearson Product Correlation Coefficient at a .05 significant level.

Reliability Testing

Case Processing Summary

		N	%
	Valid	130	100.0
Cases	Excludedª	0	.0
	Total	130	100.0

Reliability Statistics

Cronbach's Alpha	N of Items
.981	8

Result

Demographics of Respondents

Table 1: Airline_Company

| Airlines	Frequency	Percent
Air Peace	42	32.3
Ibom Air	25	19.2
Airik	43	33.1
Dana Air	20	15.4
Total	**130**	**100.0**

Table 1 above showed that there were 42 staff of Air Peace representing 32.3%, Ibom Air were 25 or 19.2%, Arik 43 or 33.1%, Dana Air, 20 representing 15.4%.

Table 2: Staff_category

Staff Category	Frequency	Percent
Flag Officer	1	.8
Information Desk	58	44.6
Air Mistress	59	45.4
Mgt Team	12	9.2
Total	**130**	**100.0**

Table 2 above showed that there was 1 flag officer representing .8%, information officers were 58 or 44.6%, Air Mistress 59 or 45.4%, and Mgt Team 12 or 9.2%.

Charts Showing demographics of Respondents

Airline_Company

Staff_category
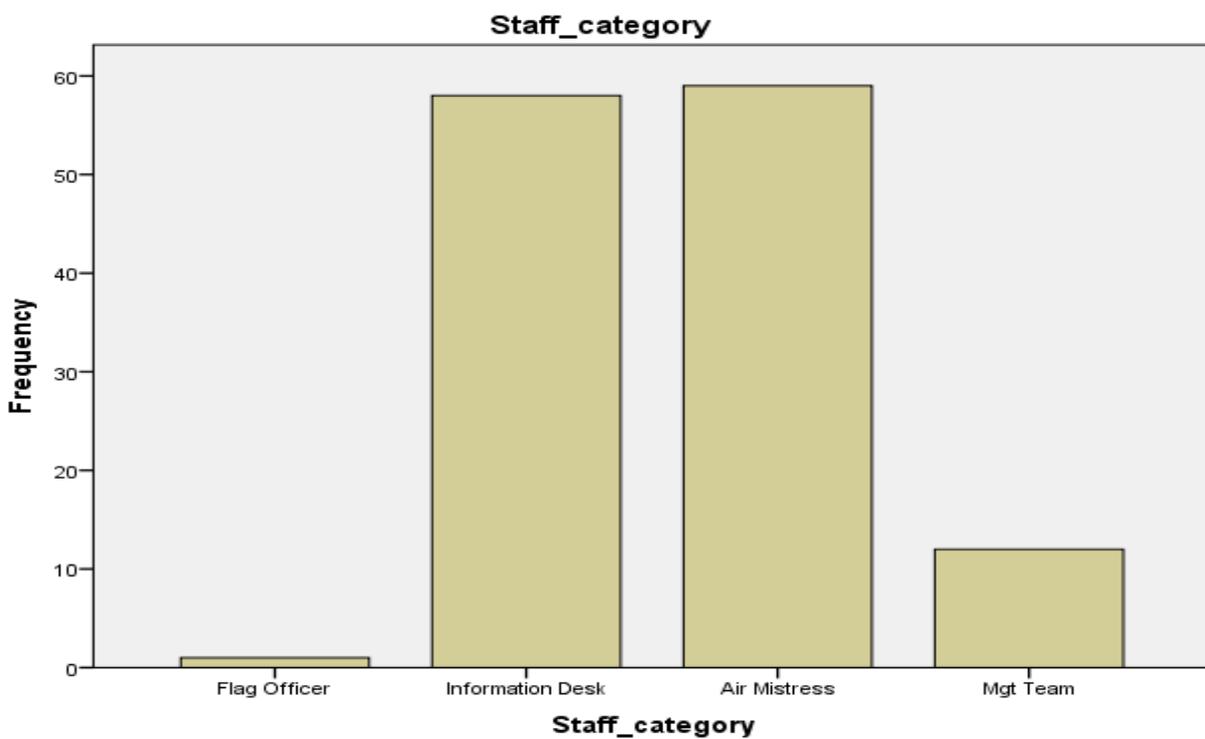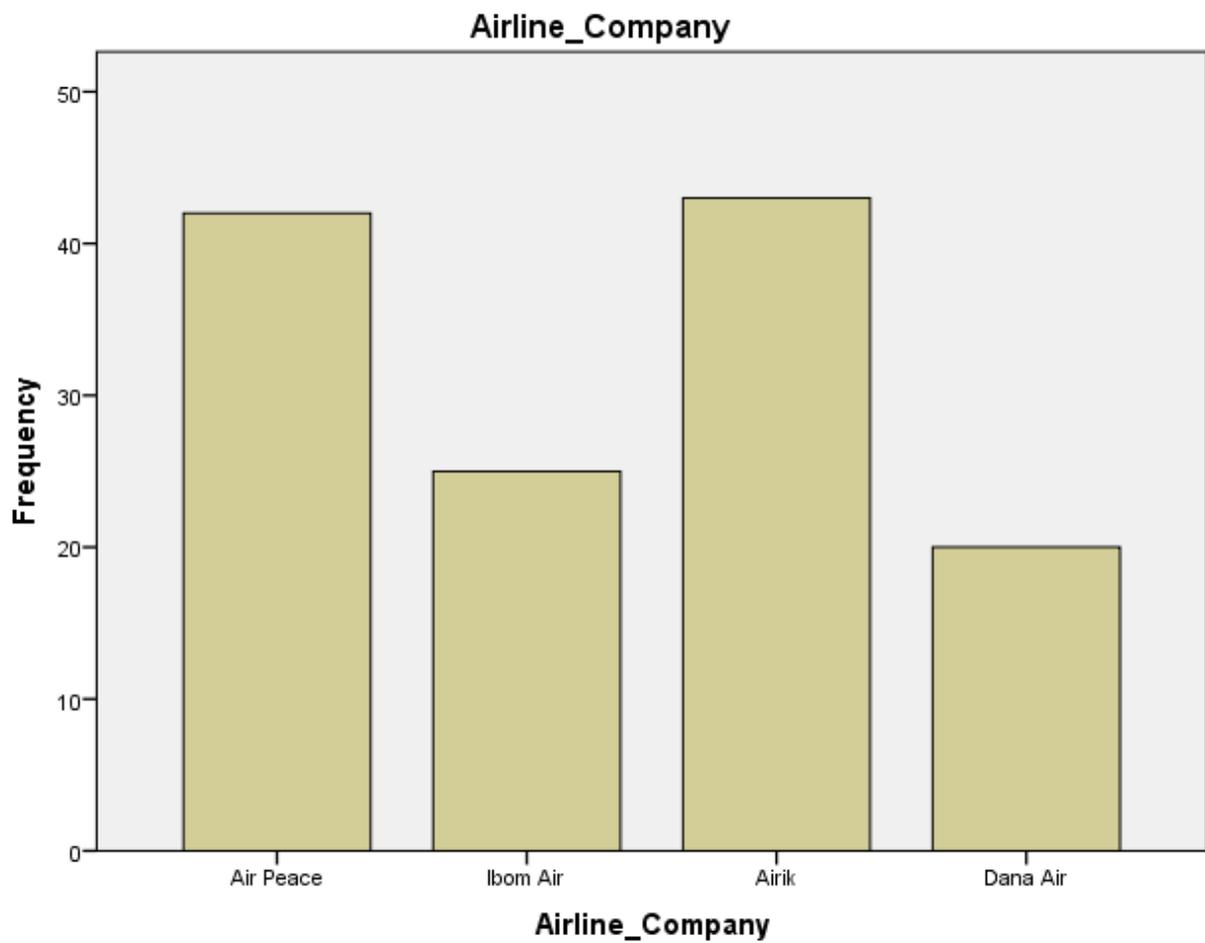
Answers to Research Questions

Research Question one: To what extent does Artificial Intelligence relate with operational performance in the Port Harcourt International Airport?

Table 3: Mean and Standard Deviation of the extent Artificial Intelligence relate with operational performance in the Port Harcourt International Airport

Descriptive Statistics

Items	N=130	Mean	Std. Deviation	Remark
1.There is ability to operate technical inclined machines		2.76	1.21	High Extent
2, There is ethical knowledge of machines interacting with man		2.69	1.50	High Extent
3.there is collaboration of of AI facilities in the airline with man		1.83	1.11	Very Low Extent
4. there is understanding of machines that classifies as AI		3.11	1.12	High Extent
Grand Mean		**2.64**	**1.24**	**High Extent**

Table 3 above showed high extent in item 1 with mean score of 2.76 and STD 1.21 that there is ability to operate technical inclined machines. Item 2 equally showed high extent with mean score of 2.69 and STD 1.50 that 2, there is ethical knowledge of machines interacting with man. Item 3 showed very low extent with mean score of 1.83 and STD 1.11 that. there is collaboration of AI facilities in the airline with man and item 4 with mean score of 3.11 and STD 1.12 showed high extent that 4. there is understanding of machines that classifies as AI.

Thus grand mea score of 2.64>2.5 indicates high extent that Artificial Intelligence relate with operational performance in the Port Harcourt International Airport.

Research Question 2: To what extent does internet of everything relate with operational performance in the Port Harcourt International Airport?

Table 4: Mean and Standard Deviation of extent internet of everything relate with operational performance in the Port Harcourt International Airport

Descriptive Statistics

Items	N=130	Mean	Std. Deviation	Remark
5. Staff are able to communicate flight cancellation to passengers as a group 24 hours before maturity		1.6615	1.07512	Very Low Extent
6. Information could be sent to concerned passengers		1.6308	1.27674	Very Low extent
7. Passenger(s) replies to airline is followed up		2.4000	1.23011	Low Extent
8. Company informs its members and passengers in concerning information		2.0692	1.35365	Low Extent
Grand Mean		**1.94**	**1.23**	**Low Extent**

Table 4 above showed in item 5 mean score of 1.66 and STD 1.07 implying very low extent that Staff are able to communicate flight cancellation to passengers as a group 24 hours before maturity. Item 6 showed very low extent that Information could be sent to concerned passengers with mean score of 1.63 and STD 1.27. Item 7 showed 2.40 and STD 1.23 that Passenger(s) replies to airline is followed up. Item 8 with mean score of 2.06 and STD 1.35 equally showed very low extent that 8. Company informs its members and passengers in concerning information.

Thus grand mean score of 1.94<2.5 showed low extent that internet of everything relate with operational performance in the Port Harcourt International Airport

Test of Null Hypotheses

Ho1: There is no significant relationship between Artificial Intelligence and operational performance in the Port Harcourt International Airport.

Table 5: Pearson Product Correlation Coefficient test of significant relationship between Artificial Intelligence and operational performance in the Port Harcourt International Airport

Correlations

		Artificial Intelligence (AI)	Operational Performance
Artificial Intelligence (AI)	Pearson Correlation	1	-.151**
	Sig. (2-tailed)		.000
	N	130	130
	Pearson Correlation	.083**	.600**
	Sig. (2-tailed)	.002	.000
	N	130	130
Operational Performance	Pearson Correlation	-.151**	1
	Sig. (2-tailed)	.000	
	N	130	130

Table 5 above showed N-value of 130, correlation coefficient (Spearman rho) value of .039, p-value of .002<.05 which showed that there is significant relationship between Artificial Intelligence and operational performance in the Port Harcourt International Airport. The null hypothesis is therefore rejected

Ho2: There is no significant relationship between internet of everything and operational performance in the Port Harcourt International Airport

Table 6: Pearson Product Correlation Coefficient of the Significant test of relationship between internet of everything and operational performance in the Port Harcourt International Airport

Correlations

		Operational Performance	Internet of Everything
Internet of Everything	Pearson Correlation	1	-.151**
	Sig. (2-tailed)		.000
	N	130	130
	Pearson Correlation	.083**	.600**
	Sig. (2-tailed)	.002	.000
	N	130	130
Operational Performance	Pearson Correlation	-.151**	1
	Sig. (2-tailed)	.000	
	N	130	130

Table 21 showed in n-value of 130, coefficient value of .195, p-value of .000<.05 which showed that there is a significant relationship between internet of everything and operational performance in the Port Harcourt International Airport. The null hypothesis is therefore rejected.

Summary of Findings

The findings of the study of the study summarizes thus:

1. There is a significant relationship between Artificial Intelligence and operational performance in the Port Harcourt International Airport
2. There is a significant relationship between internet of everything and operational performance in the Port Harcourt International Airport
3. There is high extent of Artificial Intelligence relate with operational performance in the Port Harcourt International Airport.

4. There is low extent internet of everything relate with operational performance in the Port Harcourt International Airport.

Discussion of Findings

The findings of the study are hereunder discussed, in line with the objectives of the study:

Relationship between Artificial Intelligence and operational performance

The study's results showed that there is a strong link between Artificial Intelligence and how well things run at the Port Harcourt International Airport. The current finding is supported by Nweke (2023), who defines Artificial Intelligence (AI) as the simulation of human intellect in machines trained to think, learn, and execute activities that typically necessitate human cognition or reasoning. Andre,

Frank, and Terry (2019) say that at its heart, AI lets computers process data, find patterns, make judgements, and change when they get new knowledge without needing help from people. AI technologies are becoming more and more important to how airports work. They make things run more smoothly, make them safer, and change how passengers feel about their trips.

Relationship between Internet of everything and operational performance

The study's results demonstrated that there is a strong link between the internet of everything and how well the Port Harcourt International Airport runs. Nweke (2024) posited that the Internet of Everything (IoE) is an extension of the Internet of Things (IoT), integrating devices, items, individuals, processes, and data into a cohesive network that improves communication and collaboration across multiple industries. It is the link between technology and the way people and machines or software work together to make things run smoothly. For example, at the airport, timely and effective operation of the processes is very important in aviation because delays make expenses go up. This also means that using the Internet of Everything could add value, making it a good marketing approach for anilines (Adiele, 2023).

Conclusion

The study examined relationship between digital transformation strategies and operational performance of public sector, a study of Port Harcourt Int'l Airport, Port Harcourt, Nigeria. The findings of the study showed that listed airlines in the Port Harcourt International Airport have understanding or availability of Artificial Intelligence but that it does not reflect on their information strategies in the use of internet of Everything. That customers are not aware of changes within reasonable period of time. The airlines investigate do not have the time consciousness of its customers by relating information of travel of importance to such passengers as early as possible.

Recommendations

Based on the findings of the study, the following recommendations have been made:

1. Management should be upgrade its Artificial Intelligence facilities to be prompt in informing passengers on any travel changes, including flight cancellation.
2. Management should train and retrain staff, possibly over-seas on the use of information high way or internet in management information of passengers in the listed airlines.

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