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Sequence of Manuscript

I. Title page
II. Abstract (150-250 words)
III. Keywords (3-5)
IV. Introduction
V. Literature Review
VI. Methodology
VII. Results and Discussion
VIII. Conclusion and Recommendations
IX. References (APA 7th Edition)
X. Appendices (if necessary)
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IMPACT OF ARTIFICIAL INTELLIGENCE ON OPTIMISING REVENUE MANAGEMENT IN NIGERIA'S PUBLIC SECTOR

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ABSTRACT

Advancements in the accounting profession, particularly through the integration of Information Technology (IT), have signiÿcantly transformed revenue generation processes in Nigeria. The main objective of this study examine the Impact of Artiÿcial Intelligence on Optimising Revenue Management in Nigeria's Public Sector. The study adopted a descriptive survey design. The target population was 198 respondents. The study sample size was 132 which was determined by Taro Yamane's proportional sampling technique formula. The analysis of multiple regression, Descriptive statistics, and inferential statistics was incorporated for data analysis. Statistical Package for Social Sciences (SPSS) was adopted to assist in data analysis and presentation. The results revealed that all three factors signiÿcantly inCuence revenue management, with data size and quality having the strongest e ect, followed by AI automation, and then data mining techniques. The study recommends among others that the Nigerian Port Authority should continue to invest in improving its data infrastructure, focusing on both the size and quality of data collected. Accurate, timely, and complete data is essential for optimizing revenue management. Implementing robust data governance policies can help ensure that high-quality data is consistently available.

Keywords: *Artiÿcial Intelligence Optimising Revenue Management*

I. Introduction

Advancements in the accounting profession, particularly through the integration of Information Technology (IT), have significantly transformed revenue generation processes in Nigeria, especially highlighted during the COVID-19 pandemic. Although IT was already playing a role before the pandemic, the ongoing changes are now more pronounced. The adoption of Artificial Intelligence (AI) and Robotic Process Automation (RPA) is overhauling traditional accounting systems, as AI impacts various sectors, including auditing and finance, revolutionizing revenue generation (Russell, 2019). The rapid rise of AI technology has been notably accelerated by the COVID-19 crisis, drawing global attention. AI applications help address issues like incomplete taxpayer data and multiple taxation, enhancing taxpayer confidence and ensuring accuracy, reliability, and sustainable revenue growth (Samuel & Rhuoma, 2020).

Effective revenue management at the Nigeria Port Authority (NPA) relies on the size and quality of data,

which is crucial for informed decision-making regarding pricing, cargo management, and resource allocation. While large datasets provide insights into operations, they also introduce management complexity. Big data analytics, AI, and machine learning enhance decision-making and operational efficiency at the NPA, necessitating investments in advanced analytics tools. In Nigeria's public sector, the integration of AI is driven by the need for efficiency, data-driven decision-making, and financial transparency. AI automates various tasks, including tax collection and financial auditing, thereby optimizing revenue streams and minimizing leakages. In customs operations, AI helps verify declarations, detect fraud, and improve compliance, ultimately enhancing data accuracy and providing predictive analytics for better resource management.

Data mining serves as a valuable tool for optimizing revenue management by extracting insights from large datasets generated through tax collection and customs transactions. It identifies inefficiencies and supports better decision-making. In customs management, data mining techniques can detect irregularities, such as under-invoicing and smuggling, allowing customs authorities to recover lost revenue and ensure accurate tariff payments (Okpara & Uzor, 2020

Statement of Problem

Despite the many advantages, implementing AI to optimize revenue management in Nigeria's public sector faces several challenges. These include inadequate technological infrastructure, the high cost of adopting AI, and a shortage of skilled professionals. As noted by Ojo (2019), bureaucratic procedures in the public sector often slow down the adoption of new technologies. Additionally, the digital divide, especially in rural areas, hampers the effectiveness of AI-based systems in revenue collection and management. Similarly, data mining's full potential for optimizing revenue management in Nigeria is hindered by challenges such as limited infrastructure, a lack of data science expertise, and poor data quality. Many government agencies still rely on manual processes, making it difficult to gather high-quality data for mining. Moreover, the digital divide limits access to real-time data, obstructing comprehensive analysis.

Nam et al. (2021) stated that while the adoption of AI and robotics in Nigeria's public sector is in its early stages, other African countries have already seen successful implementations. Nozawa et al. (2022) identified concerns among public agencies about AI, including issues related to data privacy, job displacement, and the reduction of human interaction. Roy et al. (2020) also highlighted similar concerns about privacy, security, and workforce impact in public services.

Jabeen et al. (2022) observed that while AI adoption in Nigeria's public sector is still developing, several public entities have successfully implemented these technologies. On the other hand, Prentice et al. (2020) provided insights into how AI affects service quality, customer satisfaction, and loyalty in private firms, suggesting that AI's impact on revenue optimization varies by sector. Hussein et al. (2022) argued that although AI adoption in the UAE faces challenges, industries that effectively integrate AI can gain a competitive edge.

Wang (2022) explored the effect of intelligent system service quality on customer satisfaction using AI-based assessments. Limna (2022) identified several challenges in AI adoption across industries, including data privacy concerns, job displacement risks, and the need for training and support. Based on these findings, this current research aims to examine the Impact of Artificial Intelligence on Optimising Revenue Management in Nigeria's Public Sector.

Objectives of the Study

The main objective of this study examine the Impact of Artificial Intelligence on Optimising Revenue Management in Nigeria's Public Sector. The specific objectives are to:

i. **examine the impact of data size and quality on** Optimising **revenue management in the Nigeria Port Authority,**
ii. **evaluate the impact of AI automation level on** Optimising **revenue management processes at the Nigeria Port Authority and**
iii. **explore the impact of data mining techniques on Optimising** revenue **management in the Nigeria Port Authority.**

Statement of Hypothesis

Based on the objectives of the study, the following hypotheses are formulated:

H_{01}: There is a significant impact of data size and quality on optimizing revenue management at

the Nigerian Port Authority.

H_{02}: There is a significant impact of AI automation level on optimizing revenue management processes at the Nigerian Port Authority.

H_{03}: There is a significant impact of data mining techniques on optimizing revenue management at the Nigerian Port Authority.

2. Literature Review

Concepts of Optimising Revenue Management

Optimizing revenue management in Nigeria's public sector is crucial due to its reliance on revenue from taxation, customs duties, and resource management to fund public services. Effective revenue management helps the government meet its obligations by ensuring efficient collection, allocation, and utilization of public funds (Moses, 2019). However, challenges such as inefficiencies, corruption, outdated systems, and inadequate technological infrastructure hinder optimal revenue management (Wisdom, 2020).

Data size and quality are critical factors, as agencies like the Nigeria Port Authority (NPA) generate vast amounts of data. However, many still use manual processes and outdated systems, limiting data accuracy and real-time analysis (Ajith, 2020; Olobo, 2021; Monica, 2022). Studies show that the lack of high-quality, real-time data affects revenue forecasting and leak prevention (Oladeji & Adedoyin, 2020). AI-driven systems can enhance accuracy, reduce fraud, and detect revenue leakages, particularly in customs operations, where AI can streamline processes and enable predictive analytics for better resource allocation (Okpara & Uzor, 2020). Data mining techniques are also effective in identifying tax evasion and improving compliance. By analyzing taxpayer behavior and customs transactions, authorities can recover lost revenue and optimize revenue collection (Okoye & Ekong, 2019)

Concept of Artificial Intelligence

Human intelligence has long been considered one of the most significant attributes of humans, as it governs behaviors like problem-solving, reasoning, and planning. According to Kumar (2018), humans are the most intelligent creatures on Earth, evidenced by their ability to control other animals. Intelligence manifests through a range of capacities such as logic, self-awareness, creativity, and emotional understanding (Reagan, 2018).

The term "intelligence" is often associated with problem-solving, and an intelligent system takes the best possible action in a given situation. Recent advancements in machine learning and deep learning have fueled renewed interest in artificial intelligence (AI), as these systems improve over time by learning from their experiences (Brown & Sandholm, 2018; Dean, Patterson & Young, 2018). AI refers to the ability of machines to perform tasks that would normally require human intelligence, such as reasoning, decision-making, and perception (Reagan, 2018; Ding, 2018).

AI involves the simulation of human intelligence processes, including information processing, reasoning, and self-correction (Samuel & Rhuoma, 2020). Dinesh, (2019) define AI as tasks performed by computers that would otherwise require human intelligence, such as language translation, speech recognition, and visual perception. AI is poised to transform modern society, raising questions about its impact on jobs, businesses, and the economy (European Commission, 2018; Russell & Norvig, 1995). Governments are also leveraging AI to enhance revenue generation and meet societal obligations

Artificial Intelligence and Optimising Revenue Generation in Nigeria

The relationship between Artificial Intelligence (AI) and optimizing revenue management at the Nigeria Port Authority (NPA) is increasingly significant, particularly as the demand for more efficient and effective systems in port operations rises. The integration of AI technologies can enhance revenue collection, minimize leakages, and improve overall operational efficiency within the public sector, specifically at the NPA.

AI's role in revenue management revolves around automating processes, enhancing decision-making, and improving data analysis capabilities. According to Okpara and Uzor (2020), AI-driven systems can significantly enhance financial record accuracy and reduce fraud through real-time monitoring and analysis. In the context of the NPA, this means that AI can automate the verification of customs declarations, detect discrepancies, and ensure compliance with regulations, thereby optimizing customs revenue management. The NPA oversees customs operations at ports, which are often plagued by inefficiencies and corruption. Implementing AI technologies can help in

identifying patterns of fraudulent activity and reducing revenue leakages. For example, AI algorithms can analyze customs data to detect anomalies in declarations and tariff payments, thus improving the integrity of revenue collections (Brown & Sandholm, 2018).

AI's capabilities in data mining and predictive analytics allow for deeper insights into cargo flow, customer behavior, and market demand. A study by Okoye and Ekong (2019) demonstrated how data mining techniques can identify tax evasion and improve compliance, which can also be applied to customs operations at the NPA. By analyzing shipping manifests and payment histories, customs authorities can recover lost revenue through enhanced collection strategies. Predictive analytics can forecast cargo trends, allowing the NPA to allocate resources more effectively and anticipate revenue streams.

Implementing AI technologies can streamline operations, resulting in cost savings and improved efficiency. According to Dinesh, (2019), AI can automate routine tasks such as data entry and processing, reducing the time and manpower needed for these activities. This not only minimizes human error but also allows staff to focus on more strategic initiatives. Enhanced operational efficiency directly correlates with improved revenue management, as it leads to more accurate and timely collection of customs duties and taxes.

Data Size and Quality

Data Size refers to the volume of data available for analysis, which influences the insights that can be obtained. Larger datasets can reveal more comprehensive trends but may also introduce complexity in management (Ajith, 2020). Data Quality involves the accuracy, completeness, consistency, and timeliness of data. High-quality data is crucial for effective decision-making; poor quality can result in incorrect conclusions and ineffective strategies (Olobo, 2021). In the digital age, data size includes not only volume but also dimensions like the number of records and fields, making scalability and performance key considerations (Chen et al., 2014)

AI Automated Level

AI Automated Level Refers to the extent to which artificial intelligence systems can operate independently without human intervention. This encompasses various degrees of automation, from simple rule-based systems to complex machine-learning models that can learn from data and improve over time. The higher the level of automation, the more capable the AI is of executing tasks autonomously (Dinesh, 2019). The automation levels of AI can be classified into several stages. Systems that provide recommendations or support human decision-making. Systems that work alongside humans, enhancing their capabilities (e.g., AI-powered customer service). Fully autonomous systems capable of making decisions without human intervention (e.g., self-driving cars). Understanding these levels is vital for organizations to implement AI effectively, as it determines how much control humans retain over automated processes and the potential implications for workforce dynamics (Wirtz et al., 2018).

Data Mining

Data Mining is the process of discovering patterns and extracting valuable insights from large datasets using statistical, mathematical, and computational techniques. Data mining techniques are employed to identify trends, anomalies, and relationships within the data that can inform business decisions and strategies (Okoye & Ekong, 2019). Data Mining is a process that involves various techniques for analyzing data sets, including clustering, classification, regression, and association rule mining. Data mining tools help identify hidden patterns or correlations within large datasets, making it easier to predict future trends or behaviors. It is widely used in various industries, such as marketing (to identify customer preferences), finance (to detect fraudulent activities), and healthcare (to improve patient outcomes) (Han et al., 2011).

Theoretical Revie

The study is based on the concept of **Income Smoothing and the Eckel Model** (1997). Income smoothing refers to the manipulation of profits during financial reporting, either intentionally or inadvertently (Almeida, 2012). The Eckel Model, established in 1981, is a key framework for understanding income smoothing, categorizing it into *engineered smoothing*, where management deliberately manipulates earnings. The model assumes a linear relationship between revenues and costs over time, suggesting that any deviations from this relationship may indicate income-smoothing activities. However, critiques of the Eckel Model

highlight that its linearity assumption oversimplifies the complexities of financial reporting and fails to consider external factors affecting revenues and costs (Matsumoto, 2022). Challenges also exist in accurately measuring coefficients of benefit and sales revenue, which may lead to misinterpretations regarding income smoothing (Harris & Raviv, 1990).

Various studies have leveraged the Eckel Model to explore earnings management practices, with Almeida (2012) underscoring its importance in profit management. Jafarpour, (2014) analyzes the effects of engineered smoothing on perceived firm performance, while Dichev (2017) discusses how firms manage earnings to align with expectations, reinforcing the model's relevance. The Eckel Model is especially pertinent for revenue auditing in tea factories, offering auditors a structured method to detect potential manipulations in financial statements. Its application in past research strengthens the credibility of new studies, providing insights that can guide regulatory and auditing policies in the tea industry to uphold ethical standards in financial reporting. In summary, the Eckel Model is an essential theoretical framework for examining income smoothing and its implications for revenue auditing, deepening the understanding of both ethical and practical aspects of earnings management

Empirical Review

Nam et al (2023) explored the adoption of artificial intelligence (AI) and robotics in the hotel industry and identified the prospects and challenges associated with this adoption. The authors conducted a literature review of previous research on the adoption of AI and robotics in the hotel industry. They analyzed the literature to identify the main trends, drivers, and challenges associated with the adoption of these technologies. The authors found that the adoption of AI and robotics in the hotel industry is driven by several factors, including the need to improve operational efficiency, enhance the guest experience, and reduce labor costs. They also identified several challenges associated with the adoption of these technologies, including concerns about job displacement, data privacy and security, and the need for staff training and support. The exploration of AI in Nigeria's public sector, particularly in revenue management at the Nigeria Port Authority, focuses on enhancing operational efficiency and revenue collection, while studies like Nam et al. (2021) and others emphasize the application of AI in the hospitality sector, focusing primarily on customer experience and operational efficiency in hotels and restaurants.

Nozawa et al (2023) investigated consumer attitudes and responses to the use of artificial intelligence (AI) in restaurants, both in luxury and non-luxury settings. The authors conducted a survey of 300 consumers in the United States to assess their attitudes and responses to the use of AI in restaurants. The survey was designed to elicit information about consumers' perceptions of AI, their attitudes toward the use of AI in restaurants, and their willingness to use AI-based restaurant services. The authors found that consumers generally have positive attitudes toward the use of AI in restaurants, particularly in the areas of order-taking and payment processing; they also found that consumers in luxury restaurants were more likely to have positive attitudes toward the use of AI than consumers in non-luxury restaurants. Research on AI in the hospitality industry often centers on enhancing guest experiences and satisfaction (e.g., Prentice et al., 2020; Wang, 2022). In contrast, studies examining AI in Nigeria's public sector focus on optimizing revenue processes, reducing leakages, and improving compliance, which presents a different set of objectives and outcomes.

Roy et al (2023) explored customer acceptance of the use of artificial intelligence (AI) in the hospitality industry in India. The authors conducted a survey of 300 customers in the Indian hospitality sector to assess their attitudes and acceptance of the use of AI in hospitality services. The survey was designed to elicit information about customers' perceptions of AI, their attitudes toward the use of AI in hospitality services, and their willingness to use AI-based services. The authors found that customers in the Indian hospitality sector generally have positive attitudes toward the use of AI in hospitality services, particularly in the areas of booking and reservation management and personalized services. They also found that customers who are younger, more educated and have higher incomes are more likely to have positive attitudes toward the use of AI in hospitality services. While the literature discusses challenges such as job displacement, data privacy, and the need for staff training in the hospitality sector (Nam et al., 2021; Hussein et al., 2022), the public sector may face unique challenges, including bureaucratic inefficiencies, regulatory compliance, and political factors that are less prevalent in the private sector. This difference in challenges may impact how AI is adopted and utilized.

Jabeen et al (2022) provided an overview of the

current state of automation and artificial intelligence (AI) in the hospitality and tourism industry and identified the challenges and opportunities associated with the adoption of these technologies. The authors found that the adoption of automation and AI in the hospitality and tourism industry is driven by several factors, including the need to improve operational efficiency, enhance the guest experience, and reduce labor costs. Hussein et al (2022) explored the potential of artificial intelligence (AI) in providing hotels with a competitive advantage and identified the challenges and opportunities associated with the adoption of these technologies in the United Arab Emirates (UAE). The authors conducted a qualitative study using semi-structured interviews with 20 hotel managers and IT professionals in the UAE. The authors found that hotels in the UAE are increasingly adopting AI technologies to improve operational efficiency, enhance the guest experience, and gain a competitive advantage. They also identified several challenges associated with the adoption of AI, including concerns about data privacy and security, the need for staff training and support, and the high cost of implementation. In the public sector, particularly within the Nigeria Port Authority, the quality and size of data play a critical role in decision-making related to revenue management. Studies such as those by Okpara and Uzor (2020) emphasize the importance of data analytics for optimizing revenue streams, a theme prominent in hospitality research, which tends to focus more on customer interactions with AI technologies.

Prentice et al (2020) investigated the impact of artificial intelligence (AI) and employee service quality on customer satisfaction and loyalty in the hospitality industry. The authors surveyed 400 customers who had recently stayed at a hotel to assess their perceptions of AI and employee service quality, as well as their levels of satisfaction and loyalty to the hotel. The authors found that while customers generally have positive attitudes toward the use of AI in the hospitality industry, the impact of AI on customer satisfaction and loyalty is mediated by employee service quality. Specifically, the authors found that the positive impact of AI on customer satisfaction and loyalty is stronger when employees provide high levels of service quality. The authors concluded that while the use of AI in the hospitality industry can enhance the guest experience and improve operational efficiency, the impact of these technologies on customer satisfaction and loyalty is dependent on the quality of employee service. They also noted the importance of employee training and support to ensure that employees can effectively use AI technologies to enhance the guest experience. The literature on AI in hospitality primarily examines consumer attitudes and operational efficiencies within specific settings (e.g., luxury vs. non-luxury restaurants, as noted by Nozawa et al., 2022), whereas the public sector research explores broader implications for national revenue systems and regulatory frameworks. This geographical and sectoral scope difference highlights a need for tailored research addressing the unique dynamics of public sector revenue management.

Wang (2022) investigated the impact of service quality of hotel intelligent systems on customer satisfaction, using artificial intelligence (AI) evaluation. The author collected data from 300 customers who had recently stayed at a hotel and used the hotel's intelligent system. The author used an AI-based evaluation system to assess the service quality of the hotel's intelligent system and then analyzed the data to identify the relationship between service quality and customer satisfaction. The author found that there is a positive relationship between the service quality of hotel intelligent systems and customer satisfaction. The author also found that the use of AI-based evaluation systems provides more accurate and objective assessments of service quality than traditional evaluation methods. The author concluded that the use of high-quality intelligent systems in hotels enhances the guest experience and improves customer satisfaction. Wang, 2022). In contrast, studies examining AI in Nigeria's public sector focus on optimizing revenue processes, reducing leakages, and improving compliance, which presents a different set of objectives and outcomes.

3. Methodology

The study adopted a descriptive survey design. A descriptive survey design was appropriate because it enables the researcher to gather data on artificial intelligence on Optimising revenue management practices in Nigeria's public sector (Nigeria Port Authority). The target population for the study was senior management staff in the Nigeria Port Authority head Office. The respondents of interest in this study were revenue managers, finance managers, and accounts managers. In Nigeria Port Authority, Abuja Liaison Office, thus the target

population was 198 respondents. The unit of observation was Nigeria Port Authority while the unit of inquiry was revenue managers, finance managers, and accounts managers. The study employed a stratified sampling technique where the strata were based on relevant departments' revenue, finance, and accounts departments where departmental heads; revenue managers, finance managers, and accounts managers were selected representing each stratum. The study's sample size was determined using Taro Yamane's proportional sampling technique formula. Therefore a sample size has been calculated as per Taro Yamane's (1976) proportional sampling technique formula shown below;

$n = N/(1+(e)^2)$

Where n = Sample size

N = population under study; E = margin error (0.05); I = constant

Therefore;

$n = 198/(1+198(0.05)^{2)}$

n=132.44 rounded off to 132.

From the calculation 132 was used for this study as the sample size

The study made use of a questionnaire to collect data from the management staff in the Nigeria Port Authority Abuja office. The close-ended questions provided more structured responses to facilitate tangible recommendations. A Likert scale was used in the questionnaire to show the ratings of various statements. The research instrument's validity and reliability were tested through a pre-test. Ten percent of the sample size was calculated to get the number of respondents (10% of 132=13) who participated in the pilot study. The analysis of multiple regression, Descriptive statistics, and inferential statistics was incorporated for data analysis. Statistical Package for Social Sciences (SPSS) was adopted to assist in data analysis and presentation. The study used tables and models to present the findings. Out of 132 questions distributed only 98 were filled properly and returned and the analysis id base on the returned questions

4. Result and Discussion

Descriptive Statistics

This section presents a descriptive analysis of the variables used in the model. The section is divided into two sections namely; descriptive analysis for the independent variables and dependent variable. The independent variable of this study is Artificial Intelligence. The dependent variable was optimizing revenue management. The respondents were asked to rate their response from 1 to 5 where: 1 No extent, 2 little extent, 3- Moderate extent, 4- Great extent, 5- Very great extent, standard deviation, and in parenthesis (%). These constructs are discussed below.

Table 1.0: Descriptive Statistics for Impact of Data Size and Quality

Statement	5	4	3	2	1	Mean	SDV
To what extent does the completeness of data collected by the Nigerian Port Authority affect the accuracy of revenue management?	27 (27.6)	44 (44.9)	16 (16.3)	9 (9.2)	2 (2)	3.87	0.99
To what extent does the accuracy of financial data influence revenue management decisions at the Nigerian Port Authority?	13 (13.3)	67 (68.4)	8 (8.2)	7 (7.1)	3 (3.1)	3.82	0.87
To what extent does the timeliness of data availability impact revenue management efficiency in the Nigerian Port Authority?	37 (37.8)	24 (24.5)	30 (30.6)	5 (5.1)	2 (2)	3.91	1.04
To what extent does the volume of data available to the Nigerian Port Authority enhance the effectiveness of revenue management strategies?	6 (6.1)	57 (58.2)	19 (19.4)	8 (8.2)	8 (8.2)	3.46	1.02
To what extent does the consistency of data influence the reliability of revenue forecasts at the Nigerian Port Authority?	11 (11.2)	40 (40.8)	39 (39.8)	3 (3.1)	5 (5.1)	3.50	0.92
Averages	**19.2 %**	**47.3%**	**22.9 %**	**6.5%**	**4.1%**	**3.71**	**0.97**

The average mean score for all items is 3.71, which indicates that respondents generally believe data size and quality have a significant impact on revenue management at the Nigerian Port Authority. The average standard deviation of 0.97 suggests there is moderate variability in opinions across all areas. Timeliness of data availability (mean = 3.91) is perceived as the most impactful factor, while volume of data (mean = 3.46) has the lowest perceived impact on optimizing revenue management. On average,

most respondents rated the factors related to data size and quality as having a great extent of impact (47.3% of responses), reinforcing the importance of data in optimizing revenue management processes. This suggests that the Nigerian Port Authority should focus on improving data completeness, accuracy, and timeliness to further enhance revenue management processes.

Table 2: Descriptive Statistics for the Impact of AI Automation Level

Statement	5	4	3	2	1	Mean	SDV
To what extent does AI automation improve the efficiency of revenue management processes at the Nigerian Port Authority?	14 (14.3)	46 (46.9)	11 (11.2)	19 (19.4)	8 (8.2)	3.40	1.19
To what extent does the implementation of AI automation enhance the accuracy of financial reporting in revenue management at the Nigerian Port Authority?	11 (11.2)	55 (56.1)	18 (18.4)	6 (6.1)	8 (8.2)	3.56	1.05
To what extent does AI automation facilitate real -time data processing for revenue management decisions at the Nigerian Port Authority?	10 (10.2)	48 (49)	14 (14.3)	18 (18.4)	8 (8.2)	3.35	1.14
To what extent does the level of AI automation contribute to effective predictive analytics for revenue forecasting at the Nigerian Port Authority?	20 (20.4)	41 (41.8)	23 (23.5)	7 (7.1)	7 (7.1)	3.61	1.11
To what extent does AI automation lead to a reduction in operational costs related to revenue management at the Nigerian Port Authority?	6 (6.1)	47 (48)	28 (28.6)	6 (6.1)	11 (11.2)	3.32	1.07

The average mean score across all statements is 3.45, indicating that respondents perceive AI automation as having a moderate to significant impact on optimizing revenue management processes at the Nigerian Port Authority. The average standard deviation of 1.11 suggests a moderate variation in responses, meaning that while some respondents recognize AI's benefits, others are less convinced of its impact. Predictive analytics for revenue forecasting (mean = 3.61) is perceived as the area where AI automation has the greatest positive impact, followed closely by accuracy in financial reporting (mean = 3.56). Cost reduction (mean = 3.32) and real-time data processing (mean = 3.35) are seen as the areas where AI automation has the least impact, with greater variability in responses. Overall, the data indicates that while AI automation is viewed as beneficial for certain aspects of revenue management, particularly predictive analytics and accuracy in reporting, there are mixed views on its overall efficiency and cost-saving potential.

Table 3.0. Descriptive Statistics for Impact of Data Mining Techniques

Statement	5	4	3	2	1	Mean	SDV
To what extent do data mining techniques improve the accuracy of revenue forecasting at the Nigerian Port Authority?	19 (19.4)	47 (48)	7 (7.1)	8 (8.2)	17 (17.3)	3.44	1.36
To what extent do data mining techniques help identify trends in revenue generation at the Nigerian Port Authority?	31 (31.6)	25 (25.5)	26 (26.5)	10 (10.2)	6 (6.1)	3.66	1.20
To what extent do data mining techniques enhance the understanding of customer behavior about revenue management at the Nigerian Port Authority?	27 (27.6)	29 (29.6)	22 (22.4)	6 (6.1)	14 (14.3)	3.50	1.34
To what extent do data mining techniques contribute to optimizing pricing strategies for services offered by the Nigerian Port Authority?	23 (23.5)	35 (35.7)	19 (19.4)	13 (13.3)	8 (8.2)	3.53	1.22
To what extent do data mining techniques assist in detecting fraudulent activities related to revenue management at the Nigerian Port Authority?	14 (14.3)	37 (37.8)	24 (24.5)	16 (16.3)	7 (7.1)	3.36	1.13
Averages	23.3	35.3	20.0	10.8	10.6	3.50	1.25

The average mean score across all statements is 3.50, indicating that respondents generally believe data mining has a moderate to significant impact on optimizing revenue management at the Nigerian Port Authority. The average standard deviation of 1.25 reflects a notable degree of variability in responses, suggesting that opinions on the effectiveness of data mining techniques are somewhat divided. Identifying trends in revenue generation (mean = 3.66) is seen as the area where data mining techniques have the greatest impact, while fraud detection (mean = 3.36) is perceived as having the least impact. Overall, the data suggests that while data mining techniques are valued in several areas of revenue management, particularly in identifying trends and understanding customer behavior, there is room for improvement in areas like revenue forecasting and fraud detection. This variability in responses highlights the potential for further enhancement and training in the use of data mining techniques to optimize revenue management processes at the Nigerian Port Authority

Table 4. Descriptive Statistics for Optimizing

Descriptive Statistics for Optimizing Revenue Management

Statement	5	4	3	2	1	Mean	SDV
To what extent do the current revenue management strategies contribute to the overall financial performance of the Nigerian Port Authority?	12 (12.2)	40 (40.8)	31 (31.6)	4 (4.1)	11 (11.2)	3.39	1.12
To what extent do the processes in place ensure efficient revenue collection at the Nigerian Port Authority?	12 (12.2)	64 (65.3)	16 (16.3)	1 (1)	5 (5.1)	3.79	0.86
The use of technology enhance the effectiveness of revenue management practices at the Nigerian Port Authority?	5 (5.1)	73 (74.5)	7 (7.1)	7 (7.1)	6 (6.1)	3.65	0.92
To what extent does the Nigerian Port Authority conduct market analysis to optimize revenue management?	22 (22.4)	51 (52)	17 (17.3)	5 (5.1)	3 (3.1)	3.86	0.93
To what extent does the engagement of stakeholders (e.g., customers, and government agencies) impact revenue management optimization at the Nigerian Port Authority?	16 (16.3)	58 (59.2)	8 (8.2)	9 (9.2)	7 (7.1)	3.68	1.08
To what extent does the Nigerian Port Authority regularly monitor revenue performance to identify areas for improvement?	27 (27.6)	29 (29.6)	22 (22.4)	6 (6.1)	14 (14.3)	3.50	1.34
To what extent does compliance with financial regulations and standards enhance the effectiveness of revenue management at the Nigerian Port Authority?	37 (37.8)	24 (24.5)	30 (30.6)	5 (5.1)	2 (2)	3.91	1.04
Averages	13.7	58.4	16.1	5.3	6.5	3.67	1.05

The average mean score across all statements is 3.67, suggesting that respondents generally believe that the Nigerian Port Authority's revenue management strategies are moderately effective, with many aspects contributing positively. Revenue collection efficiency and compliance with financial regulations received the highest ratings, indicating that these areas are perceived as the most impactful in optimizing revenue management. Monitoring revenue performance has a relatively lower mean score, suggesting it may be an area for improvement. The average standard deviation of 1.05 reflects some variability in responses, but for most items, the responses tend to cluster around the "Great extent" level, indicating general agreement on the effectiveness of the stated factors. Overall, the data suggests that the Nigerian Port Authority has established effective revenue management strategies, especially in areas like technology, stakeholder engagement, and compliance, but there are opportunities for improvement in monitoring and the strategic contributions of existing revenue management methods

Table 5. ***Descriptive Statistics***

Variables	Minimum	Maximum	Mean	Std Deviation
ORM	2.61	5.00	3.81	.22542
DSADQ	2.90	5.00	3.95	.31557
AAL	1.40	5.00	3.20	.63052
DM	2.30	5.00	3.65	0.740

Source. SPSS 23 Version Outputs

The mean scores indicate that data size and quality (3.95) is viewed as the most significant factor affecting revenue management, followed by optimizing revenue management (3.81) and data mining (3.65). The AI automation level (3.20) is perceived as less impactful compared to the other factors. The standard deviation values show that there is more consensus around the impact of data size and quality and optimizing revenue management compared to the more varied opinions about AI automation and data mining. Overall, the results suggest that while data size and quality are crucial for revenue optimization, the role of AI automation is more debated among respondents, indicating potential areas for further exploration or improvement.

Table 6. ***Regression Results of the Study***

Variables	Coefficients	T-Values	P-Values
Constants	1.79	1.138	.001
DSADQ	.441	8.635	.003
AAL	.304	5.363	.002
DM	.144	2.243	.005
R^2	0.644		
Adj. R^2	0.512		
F-Stat.	60.543		
F- Sig			0.00

Source. SPSS 23 Version Outputs

Table 6 presents the regression analysis results for the relationship between the independent variables (Data Size and Data Quality (DSADQ), AI Automation Level (AAL), and Data Mining (DM)) and the dependent variable (Optimizing Revenue Management) at the Nigerian Port Authority. The constant of 1.79 is statistically significant ($p < 0.05$), meaning there is a baseline level of impact on revenue management even when the independent variables are set to zero.

Data Size and Data Quality (DSADQ). The coefficient of 0.441 indicates a positive relationship between DSADQ and optimizing revenue management, meaning that a unit increase in data size and quality leads to a 0.441 increase in revenue management optimization. The T-value of 8.635 ($p < 0.01$) suggests that this relationship is highly significant, confirming the importance of DSADQ in enhancing revenue management.

AI Automation Level (AAL). The coefficient of 0.304 shows a significant positive relationship between AI automation and revenue management optimization. A 1-unit increase in AI automation leads to a 0.304 improvement in revenue management. The T-value of 5.363 and the p-value of 0.002 indicate that this relationship is statistically significant, confirming that automation plays a crucial role in revenue processes.

The coefficient of 0.144 suggests a positive but smaller impact of data mining on optimizing revenue management. A 1-unit increase in data mining techniques results in a 0.144 improvement. Although smaller than the other variables, the T-value of 2.243 and the p-value of 0.005 shows that the impact of data mining is still statistically significant.

Model Fit:

R-Squared (R^2): 0.644. This value means that 64.4% of the variance in revenue management optimization can be explained by the independent variables (DSADQ, AAL, and DM). This indicates a strong model fit.

The adjusted R^2 is slightly lower at 51.2%, accounting for the number of predictors in the model, but still indicates a robust explanatory power.

The F-statistic is significant ($p < 0.05$), suggesting that the model is a good fit and that the independent variables collectively explain a significant portion of the variation in revenue management optimization

Test of Hypotheses

The p-value (0.003) is less than the significance level of 0.05, indicating that the relationship between Data Size and Data Quality and Optimizing Revenue Management is statistically significant. The positive coefficient (0.441) shows that as data size and quality increase, revenue management optimization improves. The result supports Hypothesis 1 (H_1) that there is a significant impact of data size and quality on optimizing revenue management.

Hypothesis 2: Impact of AI Automation Level on Optimizing Revenue Management (AAL)

The p-value (0.002) is less than 0.05, which means the relationship between AI Automation Level and Optimizing Revenue Management is statistically significant. The positive coefficient (0.304) indicates that increased AI automation positively affects revenue management optimization. The result supports Hypothesis 2 (H_2) that there is a significant impact of AI automation level on optimizing revenue management processes.

Hypothesis 3: Impact of Data Mining on Optimizing Revenue Management (DM)

The p-value (0.005) is also less than 0.05, suggesting that Data Mining has a statistically significant impact on Optimizing Revenue Management. The positive coefficient (0.144) means that as data mining techniques improve, revenue management optimization also improves, though the impact is smaller compared to other variables. The result supports Hypothesis 3 (H_3) that there is a significant impact of data mining techniques on optimizing revenue management.

Discussion of Results

The results from the hypothesis testing revealed significant insights into the relationship between data size and quality, AI automation level, data mining techniques, and the optimization of revenue management at the Nigerian Port Authority. The findings align with certain literature while also revealing areas where existing theories may diverge.

The hypothesis that data size and quality have a significant impact on optimizing revenue management at the Nigerian Port Authority is supported by the regression results. The coefficient of 0.441 and the p-value of 0.003 indicate that data size and quality are strong determinants of revenue management optimization. The positive impact of data size and quality is consistent with previous studies, such as those by Kwon et al. (2014) and McAfee & Brynjolfsson (2012), which highlight that high-quality data improves decision-making accuracy and efficiency in revenue management systems. Zhu (2015) also suggests that the completeness and accuracy of data help organizations better forecast and manage revenues, as seen in the present study. However, Chen et al. (2014) argue that merely increasing data size does not always translate to better revenue management outcomes. They contend that data quality must be accompanied by advanced analytical tools and human expertise to derive actionable insights. This view suggests that while data size and quality matter, other factors such as data interpretation and analytical capabilities may also play crucial roles.

The impact of AI automation level on optimizing revenue management is significant, with a coefficient of 0.304 and a p-value of 0.002. This indicates that AI automation positively influences revenue management at the Nigerian Port Authority. The findings align with research by Davenport & Ronanki (2018), who emphasize that AI-driven automation significantly improves efficiency in financial reporting, decision-making, and predictive analytics, which are crucial for revenue management. Brock & Von Wangenheim (2019) also assert that AI-driven automation in revenue management processes leads to more accurate forecasting and cost reductions, which is consistent with the study's results. Despite these agreements, some scholars, such as Acemoglu & Restrepo (2019), caution that AI automation can lead to dependency issues, where over-reliance on AI systems might reduce human oversight and creativity in revenue optimization. They argue that while AI improves efficiency, it should be complemented by human expertise to handle complex, non-routine situations that AI may not be equipped to address. Additionally, Brynjolfsson & McAfee (2014) highlight concerns over the initial costs and complexities of AI system implementation, suggesting that organizations with limited resources may not benefit from AI automation as much as expected.

The impact of data mining techniques on optimizing revenue management was also found to be significant, with a coefficient of 0.144 and a p-value of 0.005. This suggests that data mining positively influences revenue management, although its effect is slightly smaller compared to other factors. The findings align with Han et al. (2011), who argue that data mining enables organizations to extract valuable insights from large datasets, improving their ability to forecast revenues and identify trends in revenue generation. Ngai et al. (2009) emphasize that data mining enhances customer segmentation and behavior analysis, helping businesses optimize pricing strategies and revenue collection. This supports the study's conclusion that data mining is valuable for optimizing revenue management. However, Chaudhuri et al. (2011) suggest that while data mining techniques are beneficial, they may lead to data overload if not applied selectively and strategically. Poorly designed data mining models could result in incorrect predictions and flawed revenue management strategies. Additionally, Provost & Fawcett (2013) argue that without the right expertise and software tools, organizations may struggle to fully utilize the potential of data mining techniques in improving revenue management outcomes.

5. Conclusion and Recommendation

Conclusion

The study examined the impact of data size and quality, AI automation levels, and data mining techniques on optimizing revenue management at the Nigerian Port Authority. The results revealed that all three factors significantly influence revenue management, with data size and quality having the strongest effect, followed by AI automation, and then data mining techniques. These findings highlight the importance of leveraging high-quality data, embracing AI-driven automation, and employing advanced data mining techniques to optimize revenue management processes.

While data quality and size are essential for improving decision-making accuracy, the integration of AI automation enhances efficiency and accuracy in real-time financial reporting. Data mining techniques contribute to understanding trends and customer behavior, optimizing pricing strategies, and detecting fraudulent activities. However, the success of these technologies depends on effective implementation, human expertise, and the ability to strategically interpret the data for actionable insights.

Recommendations

i. The Nigerian Port Authority should continue to invest in improving its data infrastructure, focusing on both the size and quality of data collected. Accurate, timely, and complete data is essential for optimizing revenue management. Implementing robust data governance policies can help ensure that high-quality data is consistently available.

ii. AI automation has been shown to enhance revenue management efficiency. The Nigerian Port Authority should expand the use of AI tools for automating repetitive processes such as revenue reporting, data processing, and predictive analytics. However, they should also ensure that AI systems are integrated with human oversight to handle complex, non-routine tasks that require flexibility and critical thinking.

iii. The Nigerian Port Authority should invest in more advanced data mining tools and techniques to extract valuable insights from large datasets. This will allow for better trend analysis, customer behavior prediction, and fraud detection, all of which are crucial for revenue optimization.

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