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Implementation of Digital Educational Technology: Issues for Managerial Consideration in Nigeria's Public Sector

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ABSTRACT

This work investigated Integrating Artificial Intelligence with Cloud-Based Records Management Opportunities and Challenges in Nigeria's Public Sector in Akwa Ibom State. Four research questions and four hypotheses guided the study. The descriptive survey design was adopted. Data was collected from respondents in three public sector departments in Akwa Ibom State. The population of the study comprised 950 employees in these three departments. A sample size of 280 respondents was determined using Slovin's formula with a 5% margin of error. A 32-item questionnaire titled Integrating Artificial Intelligence with Cloud-Based Records Management was developed by the researcher and administered to the staff in the sample of the population. Descriptive statistics were used to analyse and describe the data. Inferential statistics were also used to investigate the relationships between the independent and dependent variables and to test hypothesised relationships. The findings revealed that the level of implementation of cloud-based systems is low to medium, and the lack of appropriate supporting IT resources is the most significant barrier to AI implementation. However, results showed that respondents held positive perceptions towards AI implementation and noted vast possibilities for enhancing productivity and decision-making in records management. Some of the potential difficulties are the shortage of qualified human capital, high costs related to implementation, and the possible resistance of the staff to change. Thus, the study concludes and recommends that despite the awareness of the multiple opportunities offered by AI applications in PRM, major infrastructural and skill-based barriers must be overcome.

Keywords: Artificial Intelligence; Cloud Computing; Developing Countries; Digital Transformation; E-Government; Information Technology Adoption; Nigeria; Public Administration; Public Sector; Records Management

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Background

Effective governance in public administration increasingly relies on robust records management, particularly in the digital age, where advanced technologies have become essential. AI and cloud computing are reshaping data management and record-keeping in government, providing transformative potential (Makhlouf, 2024). However, with the digital shift to electronic records, new approaches for storage, management, and retrieval have emerged, introducing both opportunities and challenges in redefining public sector records management practices.

Cloud computing has revolutionised records management by enabling scalable storage, enhanced accessibility, and improved disaster recovery, addressing the limitations of traditional on-premises systems (Mell, 2011). In developing countries, cloud-based systems allow public sector organisations to bypass outdated infrastructure for more efficient solutions (Adu & Ngulube, 2017). Artificial Intelligence (AI), through technologies like machine learning and natural language processing, introduces automation, advanced search, and predictive analytics to records management. Integrating AI with cloud-based systems creates a powerful synergy, supporting intelligent, scalable, and efficient management solutions for public organisations (Mohammed, 2023).

In developing countries, integrating advanced technologies into public sector records management brings both opportunities and challenges. Nigeria, Africa's largest economy, faces issues like inadequate infrastructure, inconsistent record-keeping, and limited technology use, impacting governance, transparency, and service delivery (Asogwa, 2012). Akwa Ibom State, a southern Nigerian state, exemplifies these challenges while fostering a supportive environment for technological adoption, especially in public sector operations. As an oil-rich state, it has made strides in infrastructure and innovation, yet struggles with modernising records management. Analysing AI and cloud integration in Akwa Ibom's records management reveals the sector's digital readiness, including infrastructure, digital skills, and attitudes of public employees, crucial for addressing obstacles to adopting advanced technologies (Abdulrahman, 2015).

Despite recent recognition of records management's importance in Nigeria's public sector, limited research exists on state-level AI and cloud adoption in records management. Current practices, largely paper-based, are inefficient, error-prone, and hinder effective decision-making. AI and cloud technologies could streamline records management, automating tasks like indexing and providing secure, accessible storage. However, challenges remain, including technical, organisational, and cultural barriers. This study addresses a knowledge gap by examining the specific opportunities and challenges of integrating AI with cloud-based records management in Akwa Ibom's public sector, offering insights for potential technological advancements.

The research objectives were to:

1. Examine the current state of cloud-based records management in Akwa Ibom's public sector.
2. Assess the perceived opportunities of integrating AI technologies with cloud-based records management in Akwa Ibom's public sector.
3. Evaluate the perceived challenges of integrating AI technologies with cloud-based records management in Akwa Ibom's public sector.
4. Appraise employees' sentiments towards AI and cloud-based solutions in records management in Akwa Ibom's public sector.

Research Questions are as follows:

1. What is the current state of cloud-based records management in Akwa Ibom's public sector?

2. What are the perceived opportunities for integrating AI technologies with cloud-based records management in Akwa Ibom's public sector?
3. What are the perceived challenges of integrating AI technologies with cloud-based records management in Akwa Ibom's public sector?
4. What are employees' sentiments towards AI and cloud-based solutions in records management in Akwa Ibom's public sector?

Literature Review

Cloud Computing

Cloud computing, a transformative post-COVID-19 technology, enhances teaching and learning by providing on-demand access to various resources, such as infrastructure, applications, and collaboration tools. According to Souley & Aniobi (2014) and Singh *et al*., (2021), it enables anytime, anywhere service access through networked channels, optimising educational processes.

Cloud-Based Records Management

Cloud-based records management enhances accessibility, scalability, and cost-efficiency compared to traditional systems, offering developing countries a way to overcome tech limitations and boost public sector efficiency (Mosweu, Bwalya & Mutshewa, 2017; Adu & Ngulube, 2017).

AI in Records Management

Artificial intelligence in records management automates tasks like classification and indexing, enhancing analytical capacities. Combined with cloud-based systems, AI offers transformative potential for public sector records management.

Records Management in Nigeria's Public Sector

Nigeria's public sector faces records management challenges due to infrastructure gaps, low technology adoption, and inconsistent practices (Asogwa, 2012). Few studies explore AI and cloud solutions, especially in specific states like Akwa Ibom (Abdulrahman, 2015).

Opportunities and Challenges of AI Integration

Integrating AI with cloud records management can optimise processes, enhance security, and support data-driven decisions. It enables automation of repetitive tasks, allowing professionals to focus on complex roles, while AI analytics aids in better budgeting for public services. However, infrastructure, skills, and compatibility challenges, particularly in developing countries, may hinder implementation (Adu & Ngulube, 2017).

This study addresses a gap in the literature on AI and cloud-based records management in Nigeria's public sector, on Brazilian management and Akinola (2023) on Nigerian academic libraries. It explores organisational readiness for AI integration, a timely focus absents in prior research.

Theoretical Framework

Using the Technology Acceptance Model (TAM), this study examines the opportunities and challenges of adopting AI in Akwa Ibom's public records management (Venkatesh, & Davis, 2000).

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) by Davis (1989) suggests that perceived usefulness and ease of use are key factors in technology adoption. Perceived usefulness is how much users believe a system will enhance job performance, relevant here for AI and cloud technology in records management. Perceived ease of use reflects the effort needed, which is crucial for complex technologies in developing

contexts. Later extensions by Venkatesh *et al*., (2003) add factors like social influence and facilitating conditions relevant to public sector adoption.

Methods

This study used quantitative surveys across three public departments in Akwa Ibom to assess AI integration opportunities and adoption challenges. The study focused on employees from three public sector departments in Akwa Ibom State—Ministry of Information and Strategy, Civil Service Commission, and Ministry of Science and Technology—due to their extensive record-keeping roles. A sample of 280 respondents was selected from an estimated 950 employees using stratified random sampling.

- Ministry of Information and Strategy: 100 respondents
- Civil Service Commission: 90 respondents
- Ministry of Science and Technology: 90 respondents

This sampling technique was adopted for the study to ensure a representative sample across the selected departments while at the same time keeping the sample size manageable for data collection and analysis.

A structured questionnaire was designed according to the research objectives of the study and the existing literature review. The questionnaire consisted of five sections:

1. Demographic information
2. Current state of record keeping in the cloud
3. Opportunities for AI integration
4. Challenges hindering AI integration
5. AI and cloud solutions adoption sentiment

The questionnaire used a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree) for all items.

Questionnaires were administered in person by trained assistants over four weeks, with prior permission from authorities and assurances of participant confidentiality regarding the study's purpose. Version 25 of the Statistical Package for Social Science (SPSS) was used to analyse the study's data. The data was analysed and explained with descriptive statistics, such as means, standard deviations, frequencies, and percentages. The relationships between the independent and dependent variables were also examined, and hypothesised associations were verified using statistical methods such as multiple regression analysis and chi-square testing.

Results and Discussion

Table 1: Demographic Profile of Respondents

Characteristic	Category	Frequency	Percentage
Gender	Male	152	54.3%
	Female	128	45.7%
Age	18-30	62	22.1%
	31-40	98	35.0%
	41-50	84	30.0%
	51+	36	12.9%
Education	Secondary	28	10.0%
	Diploma	72	25.7%
	Bachelor’s	142	50.7%
	Postgraduate	38	13.6%
Department	Info & Strategy	100	35.7%
	Civil Service	90	32.1%
	Science & Tech	90	32.1%

Years of Service	0-5 years	76	27.1%
	6-10 years	94	33.6%
	11-15 years	62	22.1%
	16+	48	17.1%

The demographic profile shows that most of the sampled population were male, represented by 54.3% of the total population size, while 45.7% were female. Regarding the age of respondents, most of the respondents, 35.0%, were between the ages of 35.0% and 41-50, or 30.0%. In terms of the educational qualification of the respondents, most respondents (50.7%) hold a bachelor's degree. The department with the highest number of respondents was Information and Strategy (35.7%), followed by the Civil Service and Science and Technology (32.1%, respectively). The spread of years of service suggests that most of the respondents were 6-10 years (33.6%) and 0–5 years (27.1%), respectively. While 22.1%, 11-15 had spent 11-15 years in service. This sample spread suggests a mix of experienced and newer employees, which could provide diverse perspectives on records management and technology adoption.

Current State of Cloud-Based Records Management in Akwa Ibom's Public Sector

Table 2: Current State of Cloud-Based Records Management

Statement	Mean	SD	Interpretation
"Our department uses cloud-based systems for records management."	2.45	1.21	Low adoption
"I am familiar with cloud-based records management systems."	2.87	1.35	Moderate familiarity
"Cloud-based systems have improved our records management efficiency."	2.63	1.18	Moderate improvement
"Our current records management system is adequate for our needs."	2.31	1.09	Inadequate
"I have received training in cloud-based records management."	2.15	1.25	Low training provision

The results of the analysis on the current state of cloud-based records management in Akwa Ibom's public sector indicate a low to moderate adoption of cloud-based records management systems in Akwa Ibom's public sector. The mean scores suggest that although there is some familiarity with cloud-based systems (M = 2.87, SD = 1.35), the levels of actual adoption and implementation are relatively low (M = 2.45, SD = 1.21). Regarding the adequacy of current records management systems, most of the respondents perceive it as inadequate (M = 2.31, SD = 1.09), thus requiring the need for improvement (M = 2.63, SD = 1.18). Training on cloud-based records management had a low score for training provision (M = 2.15, SD = 1.25). This low score might perhaps suggest that training provisions on cloud-based training might be a major factor that can hinder the implementation of cloud-based systems in the sampled departments.

Perceived Opportunities for Integrating AI with Cloud-Based Records Management

Table 3: Perceived Opportunities for AI Integration

Opportunity	Mean	SD	Interpretation
Improved efficiency in record retrieval	4.21	0.89	High potential
Enhanced data security and privacy	3.98	1.02	High potential
Automated classification and indexing of records	4.15	0.95	High potential
Improved decision-making through data analytics	4.07	0.98	High potential
Reduction in manual data entry errors	4.32	0.85	Very high potential

Based on the results of the study, respondents perceive significant opportunities for AI integration in cloud-based records management. The highest-ranked opportunity is the potential for a reduction in manual data entry errors (M = 4.32, SD = 0.85). The second highest-ranked opportunity was improved efficiency in record retrieval (M = 4.21, SD = 0.89). Other opportunities, such as enhanced data security, automated classification, and improved decision-making through data analytics, are also viewed as having

high potential. These results thus point towards a more positive perception about the incorporation of AI in the Akwa Ibom public sector workforce.

Perceived Challenges Hindering the Integration of AI with Cloud-Based Records Management

Table 4: Perceived Challenges Hindering AI Integration

Statement	Mean	SD	Interpretation
Inadequate IT infrastructure	4.45	0.78	Severe challenge
Lack of skill personnel	4.23	0.92	Significant challenge
High implementation costs	4.18	0.97	Significant challenge
Data privacy and security concerns	3.87	1.05	Moderate challenge
Resistance to change among staff	3.95	1.11	Moderate to significant challenge

The results show that inadequate IT infrastructure is perceived as the most severe challenge (M = 4. 5, SD = 0.78) to AI integration in cloud-based records management. Challenges identified as significant include lack of skilled personnel (M = 4.23, SD = 0.92) and high implementation costs (M = 4.18, SD = 0.97). Other challenges, such as data privacy and security concerns (M = 3.87, SD = 1.05), and resistance to change among staff (M = 3.95, SD = 1.11) were perceived as moderate to significant challenges. These findings indicate the need for infrastructure development, capacity building, and change management strategies to support the integration of AI systems and solutions across the sampled departments.

Results Regarding Respondents' Sentiments towards AI and Cloud-Based Solutions in Records Management

Table 5: Sentiments towards AI and Cloud-Based Solutions

Statement	Mean	SD	Interpretation
"AI and cloud-based solutions can significantly improve our records management."	4.12	0.94	Positive attitude
"I am willing to learn and use AI-powered records management systems."	4.25	0.88	High willingness
"AI integration is necessary for modernizing our public sector."	4.05	1.01	General Agreement
"I am concern about job displacement due to AI adoption."	3.45	1.22	Moderate concern
"The benefits of AI integration outweigh the challenges."	3.89	1.07	General Agreement

The findings from the analysis above suggest that respondents have a general agreement towards the necessity of AI integration in modernising the public sector (M = 4.05, SD = 1.01) and that the benefits of AI integration outweigh the challenges (M = 3.89, SD = 1.07). Respondents also have a positive attitude towards AI and cloud-based solutions in record management (M = 4.12, SD = 0.94). The results also suggest that respondents have a high willingness to learn and use AI-powered records management systems (M = 4.25, SD = 0.88). There is however a moderate concern about job displacement due to AI adoption (M = 3.45, SD = 1.22). Such sentiments imply a favourable uptake of AI and cloud-based technologies in the management of records in the public sector in Akwa Ibom.

Inferential Statistics

To examine the interrelationships of variables and to test hypotheses, the chi-square test and multiple regression analysis were used.

Chi-Square Test

A chi-square test was conducted to examine the relationship between department and sentiments towards AI integration. The results are presented in Table 6 below:

Table 6: Chi-Square Test Results - Department vs. Attitude towards AI Integration

Department	Positive Attitude	Neutral	Negative Attitude	χ^2	p-value

Info & Strategy	72 (72%)	20 (%)	8 (8%)	12.45	0.014
Civil Service	58 (64.4%)	24 (26.7%)	8 (8.9%)		
Science & Tech	70 (77.8%)	15 (16.7%)	5 (5.5%)		

The chi-square test reveals a significant relationship between department and sentiment towards AI integration ($\chi^2 = 12.45$, $p = 0.014$). The Ministry of Science and Technology shows the highest proportion of positive attitudes (77.8%), followed by the Ministry of Information and Strategy (72%). This implies that there could be department-specific factors which determine the perceived attitudes towards AI adoption. This might perhaps be a result of differences in technological exposure or perceived relevance to their work.

Multiple Regression Analysis

To determine the factors that affect the perceived degree of using AI in records management, a multiple regression test was used. The dependent variable was the mean score of perceived opportunities for AI integration, while the independent variables were age, education level, years in service, and current familiarity with cloud-based systems. The results of the regression analysis are shown in Table 7.

Table 7: Multiple Regression Analysis Results

Variable	B	SE	B	T	p-value
(Constant)	2.345	0.312	7.516	<0.001	
Age	-0.118	0.056	-0.124	-2.107	0.036
Educational Level	0.287	0.078	0.226	3.679	<0.001
Years of Service	0.032	0.041	0.047	0.780	0.436
Familiarity with Cloud Systems	0.352	0.059	0.356	5.966	<0.001

($R^2 = 0.284$, Adjusted $R^2 = 0.273$, $F(4, 275) = 27.28$, $p < 0.001$)

The multiple regression model explains 28.4% of the variance in perceived potential for AI integration ($R^2 = 0.284$). The model is statistically significant too ($F(4, 275) = 27.28$, $p < 0.001$). Education level ($\beta = 0.226$, $p < 0.001$) and familiarity with cloud systems ($\beta = 0.356$, $p < 0.001$) are significant positive predictors of perceived AI potential. Age shows a moderate but significant negative relationship with AI integration ($\beta = -0.124$, $p = 0.036$), suggesting that younger employees may perceive greater potential towards AI integration. Years of service is however not a significant predictor in this model.

Current State of Cloud-Based Records Management

The study findings reveal that Akwa Ibom public sector records management systems have a low to moderate usage of cloud-based records management systems. This is in agreement with the literature on the low level of technology uptake in Nigerian public organisations (Asogwa, 2012). The perceived inadequacy of current systems ($M = 2.31$, $SD = 1.09$), again, justifies modernising records management systems in Nigerian public institutions as advocated by Abdulrahman (2015), who called for the digitisation of records management systems in Nigerian public institutions.

Opportunities for AI Integration

Respondents identified significant opportunities for AI integration, particularly in reducing manual data entry errors and improving efficiency in record retrieval. These findings corroborate argument that AI can strengthen data analytics capabilities and revolutionise record management. The high mean scores obtained from the survey across all the opportunities Means and Standard Deviations imply the awareness of AI solutions to current problems with records management in the public sector.

Challenges Hindering AI Integration

The study reveals that inadequate IT infrastructure is perceived as the most severe challenge to AI integration, followed by a lack of skilled personnel and high implementation costs. The findings align

with the works of Adu and Ngulube (2017), who identified infrastructure constraints and skill gaps as potential barriers to implementation in developing country contexts. The moderate to significant concern about resistance to change among staff highlights the need for effective change management strategies in the implementation process.

Sentiments towards AI and Cloud-Based Solutions

The respondents' overall sentiments are quite positive, and they showed interest towards the integration of AI and cloud-based solutions. This optimism and this high willingness to learn and use automated systems demonstrate that the environment is favourable to technological development. However, due to the moderate level of concern over job automation, there is a moderate concern about job displacement, indicating the need for clear communication to ensure that employees are well informed and trained properly.

Departmental Differences and Pre of Perceived AI Potential

The chi-square test revealed significant differences in attitudes towards AI integration across departments, with the Ministry of Science and Technology recording the highest mean attitude towards AI integration. The regression analysis identified that education level and familiarity with cloud-based systems and sentiments towards AI can affect attitudes towards AI adoption in the departments. This simply underlines the need to educate and train people on attitudes toward technology and technological advancement. The very low correlation with age is negative, which indicates that younger individuals can embrace AI at the workplace possibly due to greater exposure to digital technologies.

Conclusion

This study examines the integration of AI with cloud-based records management in Akwa Ibom's public sector, identifying both opportunities and challenges. While AI can improve efficiency and decision-making, obstacles like infrastructure limitations, skill gaps, and high implementation costs must be tackled. Public sector workers show a positive attitude toward AI, suggesting that proper adoption strategies could facilitate smoother implementation. The study recommends that the Akwa Ibom State government invest in IT infrastructure and provide comprehensive training to improve employees' digital skills, particularly in AI and cloud-based technologies, to support effective records management. This study explores AI integration in cloud-based records management within Nigeria's public sector, highlighting opportunities and challenges specific to Akwa Ibom. Its findings offer valuable insights for policymakers, administrators, and IT professionals, contributing to the literature on digital transformation in public sector records management.

Declarations

Ethics Approval and Consent to Participate: The prior permission was taken from authorities and assurances of participant confidentiality regarding the study's purpose.

Conflicts of Interest: The authors declare no conflict of interest, financial or otherwise.

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