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CHALLENGES HINDERING THE IMPLEMENTATION OF AI-DRIVEN DATA MANAGEMENT SYSTEMS AND STRATEGIES FOR INTEGRATING AI INTO DATA PROCESSING AND MANAGEMENT IN COLLEGES OF EDUCATION IN BENUE STATE OF NIGERIA

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ABSTRACT

This paper examined the challenges hindering the implementation of AI-driven data management systems and strategies for integrating AI into data processing and management in Colleges of Education in Benue State Nigeria. A descriptive survey research design was used and the population of the study consisted of administrators, ICT personnel, academic staff, and students. The sample size of the population is 150 respondents. In this study, multistage sampling technique involved cluster, purposive and simple random sampling techniques were used to arrive at the selection of the desired respondents. It was found that 19.4 percent of the respondent agreed that high cost of implementation is one of the challenges hindering the implementation of AI-driven data management systems in their institution, 17.3 percent of the respondents averred that inadequate infrastructure and internet connectivity is another challenge, 20.1 percent of the respondents were of the view that lack of skilled personnel is also another challenge, 9.0 percent of the respondents averred that resistance to change among staff, 21.5 percent of the respondents were of the opinion that insufficient government funding and policy support are other challenges. Providing continuous artificial intelligence training and capacity building for staff would help in integrating AI into data processing and management to enhance institutional efficiency, security, and decision-making within government-owned colleges of education also implementing robust cyber security measures to protect artificial intelligence-driven data systems would also help in integrating AI into data processing and management in institution.

Keywords : *AI-driven, data management, strategies, integrating, data processing, challenges*

INTRODUCTION

Artificial Intelligence

Artificial Intelligence (AI) refers to the simulation of human intelligence in machines, enabling them to perform tasks such as learning, reasoning, problem-solving, and decision-making (Russell & Norvig, 2020). AI is categorized into different types, including machine learning, deep learning, natural language processing (NLP), and expert systems, all of which are increasingly applied in various domains, including education and data management (Goodfellow, Bengio, & Courville, 2016).

In the context of education, AI has been leveraged to automate administrative tasks, enhance learning experiences, and improve decision-making processes through predictive analytics and intelligent tutoring systems (Luckin, 2016). AI-driven tools can analyze large datasets, identify trends, and generate insights, leading to improved efficiency and accuracy in institutional management (Schmidt & Cohen, 2020). However, challenges such as data privacy concerns, high implementation costs, and the need for technical expertise hinder AI adoption in many educational institutions (Eze, Chinedu-Eze, & Bello, 2020).

Data

Data is defined as raw, unprocessed facts, figures, or symbols that represent real-world conditions and serve as the foundation for decision-making (Kimball & Ross, 2013). Data can be structured, semi-structured, or unstructured, depending on its format and organization. Structured data is highly organized and stored in relational databases, while unstructured data includes text, images, and multimedia files that require advanced processing techniques for analysis (McAfee & Brynjolfsson, 2017).

In educational institutions, data plays a crucial role in academic administration, student management, and institutional planning. Student records, faculty information, examination results, and financial transactions constitute essential data assets that require efficient handling and security measures (Redman, 2018). The increasing volume

of data generated by institutions highlights the importance of adopting advanced data processing and management strategies to ensure accuracy, security, and accessibility (Provost & Fawcett, 2013).

Data processing

Data processing refers to the systematic collection, transformation, and analysis of raw data to generate meaningful insights and facilitate informed decision-making (Zikopoulos & Eaton, 2011). The data processing cycle includes stages such as data collection, storage, processing, output generation, and feedback. Traditional data processing methods often rely on manual input and legacy systems, which can lead to inefficiencies and errors (Davenport & Prusak, 1998).

AI-powered data processing systems enhance efficiency by automating data entry, classification, and analysis using machine learning algorithms (Provost & Fawcett, 2013). These systems enable real-time data processing, anomaly detection, and predictive modeling, improving institutional decision-making in education (Schmidt & Cohen, 2020). However, challenges such as data security risks, high computational requirements, and integration issues with existing infrastructure must be addressed to fully harness AI's potential in data processing (Kimball & Ross, 2013).

Data management

Data management encompasses the policies, procedures, and technologies used to ensure the accuracy, security, and accessibility of data throughout its life cycle (Davenport & Prusak, 1998). Effective data management involves data governance, storage, security, backup, and recovery processes that maintain data integrity and compliance with regulatory standards (Redman, 2018). Educational institutions require robust data management frameworks to handle student records, course registrations, examination results, and financial transactions. AI-driven data management solutions enhance data governance by automating data classification, detecting inconsistencies, and optimizing data retrieval processes (Oladimeji, 2022). These technologies improve operational efficiency, reduce human errors, and enable data-driven decision-making (Eze, 2020). Despite these advantages, data management in government-owned colleges of education in Nigeria faces challenges such as inadequate infrastructure, lack of skilled personnel, and resistance to technology adoption (Zhou, 2021).

OBJECTIVES

(1) To elicit responses on the challenges hindering the implementation of AI-driven data management systems in these institutions;

(2) To determine strategies for integrating AI into data processing and management to enhance institutional efficiency.

METHODOLOGY

Research design

This study adopted a descriptive survey research design. This design is appropriate as it allows for the systematic collection, analysis, and interpretation of data on AI adoption and its impact on data processing and management in government-owned colleges of education.

Area of study

Benue State, situated in the North-Central region of Nigeria, was established on February 3, 1976. The state derives its name from the Benue River, the second-largest river in Nigeria, which traverses the region. Makurdi serves as the state capital and functions as a significant commercial and administrative center. The prominent colleges of education include: College of Education, Katsina-Ala, College of Education, Oju and Federal College of Education, Odugbo

Population of the study

The target population for this study include administrators, ICT personnel, academic staff, and students in government-owned colleges of education in Benue State. These populations are directly involved in or affected by data management processes in these institutions.

Sample size and sampling technique

The sample size of the population is 150 respondents. In this study, multistage sampling technique involved cluster, purposive and simple random sampling techniques were used to arrive at the selection of the desired respondents. The table below showed how the area was clustered in line with the existing stratified colleges of education in the study.

Table 1: Existing colleges of education in benue state for the study

Sr. No.	College of Education	Respondents
1	Katsina-Ala	50
2	Oju	50
3	Odugbo	50
	Total	**150**

Methods of data collection

This paper employed one method of data collection

which is questionnaire. The questionnaire consisted of both closed-ended and open-ended questions to gather data on AI adoption, challenges, and potential benefits.

The segment was divided into two sections. The first section dealt with challenges hindering the implementation of AI-driven data management systems in the institutions, the second section dwelt on the strategies for integrating AI into data processing and management to enhance institutional efficiency, security, and decision-making within government-owned colleges of education**.** Thus, a total number of 150 questionnaires were administered to 150 respondents in the study area; however, only 144 questionnaires were returned and found valid, 6 questionnaires were missing. Thus, data was collected from 144 respondents in this study.

The data collected data was analyzed using quantitative techniques. Descriptive statistics such as frequency, and percentage distributions were used to summarize the data.

RESULTS AND DISCUSSION

Table 2: Respondents' views on the challenges hindering the implementation of AI-driven data management systems in these institutions (n=144)

Sr. No.	Response	Frequency	Percent
1	High cost of implementation	28	19.4
2	Inadequate infrastructure and internet connectivity	25	17.3
3	Lack of skilled personnel	29	20.1
4	Resistance to change among staff	13	09.0
5	Insufficient government funding and policy support	31	21.5
6	Security and privacy concerns	18	12.5

Source: Field Survey, 2025

The data presented in Table 2 indicated that 28 (19.4%) of the respondent agreed that high cost of implementation is one of the challenges hindering the implementation of AI-driven data management systems in these institutions, 25 (17.3%) of the respondents averred that inadequate infrastructure and internet connectivity is another challenge, 29 (20.1%) of the respondents were of the view that lack of skilled personnel is also another challenge, 13 (9.0%) of the respondents averred that resistance to change among staff, 31 (21.5%) of the respondents were of the opinion that insufficient government funding and policy support are other challenges, while 18 (12.5%) of the respondents agreed that security and privacy concerns constituted a challenge. Thus, this implies that all the sampled respondents are aware of the challenges hindering the implementation of AI-driven data management systems in colleges of education in Benue State.

Table 3: Respondents' views on the strategies for integrating AI into data processing and management to enhance institutional efficiency, security, and decision-making within government-owned colleges of education

(n=144)

Sr. No.	Response	Frequency	Percent
1	Providing continuous artificial intelligence training and capacity building for staff	27	18.7
2	Increasing government funding and investment in artificial intelligence infrastructure	25	17.3
3	Implementing robust cyber security measures to protect artificial intelligence-driven data systems	29	20.1
4	Encouraging collaboration with artificial intelligence technology providers for customized solutions	26	18.0
5	Establishing policies and regulatory frameworks for artificial intelligence adoption	30	20.8
6	Conducting periodic assessments to monitor artificial intelligence performance and effectiveness	07	4.8

Source: Field Survey, 2025

Table 3 above presented data collected on the strategies for integrating AI into data processing and management to enhance institutional efficiency, security, and decision-making within government-owned colleges of education in Benue State. The available data shows that 27 (18.7%) of the respondents said providing continuous artificial intelligence training and capacity building for staff would help in integrating AI into data processing and management to enhance institutional efficiency, security, and decision-making within government-owned colleges of education, 25 (17.3%) of the respondents were of the view that **i**ncreasing government funding and investment in artificial intelligence infrastructure would help, 29 (20.1%) of the respondents submitted that implementing robust cyber security measures to protect artificial intelligence-driven data systems would also help in integrating AI into data processing and management to enhance institutional efficiency, security, and decision-making within government-owned colleges of education, 26 (18.0%) of the respondents averred that **e**ncouraging collaboration with artificial intelligence technology providers for customized solutions is another way of curbing the challenges, 30 (20.8%) of the respondents agreed that establishing policies and regulatory frameworks for artificial intelligence adoption would help, while 7 (4.8%) of the respondents were of the opinion that conducting periodic assessments to monitor artificial intelligence performance and effectiveness would also help.

Thus, this implies that all the sampled respondents are aware of challenges hindering the implementation of AI-driven data management systems and made their various suggestions toward curbing the challenges.

CONCLUSION

The challenges discovered include the high cost of AI implementation, inadequate ICT infrastructure and internet connectivity, a lack of skilled personnel, resistance to change among staff, insufficient government funding and policy support, and concerns about data security and privacy. These barriers have hindered the widespread adoption of AI-driven data management solutions, thereby limiting the efficiency and effectiveness of administrative processes in these institutions. Despite these challenges, AI remains a transformative tool that, if properly integrated, can enhance data accuracy, streamline administrative functions, and improve decision-making processes in colleges of education.

RECOMMENDATIONS

(1) Improved ICT Infrastructure – Investments should be made in upgrading internet connectivity, establishing data centers, and equipping colleges with modern computing facilities to support AI-driven data management.

(2) Capacity Building and Training – Regular AI training programs should be introduced for academic and administrative staff to enhance their digital skills and ensure effective implementation and management of AI systems.

CONFLICT OF INTEREST

The authors of the paper declare no conflict of interest.

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