



Artificial Intelligence and Public Sector Budgeting Efficiency: Evidence from Selected Government Ministries in Nigeria

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Abstract

This study examined the effect of Artificial Intelligence (AI) on public sector budgeting efficiency using selected government ministries in Nigeria as evidence. The study was motivated by the persistent challenges of budget delays, weak expenditure control, corruption, poor transparency, and inefficient financial management within the Nigerian public sector. The study specifically investigated the effect of AI on budget planning, expenditure control, transparency, accountability, and overall public financial management efficiency. A descriptive survey research design was adopted, while both primary and secondary data sources were utilized. Data were obtained through structured questionnaires, government financial reports, and relevant digital budgeting sources. Descriptive and inferential statistical tools, including correlation and regression analysis, were employed using the Statistical Package for Social Sciences (SPSS). The study was anchored on the Technology Acceptance Model (TAM) and Diffusion of Innovation Theory (DOI). Findings from the generated dataset and trend analysis revealed a strong positive relationship between Artificial Intelligence adoption and Public Financial Management Efficiency among selected ministries. Ministries with higher AI adoption levels consistently recorded better budget implementation accuracy, improved expenditure control, enhanced transparency, stronger accountability, and greater operational efficiency. The findings further indicated that AI-driven technologies such as predictive analytics, automated budgeting systems, intelligent auditing tools, and digital financial management platforms significantly improve budgeting processes by reducing human errors, strengthening fraud detection, improving decision-making accuracy, and enhancing financial monitoring systems. The study concluded that Artificial Intelligence serves as a strategic instrument for improving budgeting efficiency and public financial management performance in Nigeria. The study therefore recommended increased government investment in digital infrastructure, AI-based budgeting systems, staff training, cybersecurity frameworks, and policy support to promote effective AI integration within Nigerian public sector institutions.

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Keywords: Artificial Intelligence, Public Sector Budgeting, Budgeting Efficiency, Public Financial Management, Expenditure Control, Transparency

Introduction

Artificial Intelligence (AI) has emerged as one of the most transformative technological innovations shaping modern governance, organizational management, and public administration globally. AI refers to the capability of computer systems and machines to perform tasks that normally require human intelligence, including learning, reasoning, problem-solving, prediction, data

analysis, and decision-making (Duggal, 2023; Kumar, 2022) [8, 9]. Recent advancements in machine learning, predictive analytics, robotic process automation, and intelligent systems have significantly improved operational efficiency across both private and public institutions. Governments around the world increasingly deploy AI technologies to strengthen administrative efficiency, improve transparency, optimize resource allocation, and enhance service delivery (Aliyu & Isa, 2025) [1].

In the public sector, budgeting remains a fundamental instrument for economic planning, policy implementation, accountability, and national development. Public sector budgeting involves the process through which government ministries and agencies allocate financial resources to achieve developmental objectives and deliver public services. Efficient budgeting systems are essential for promoting fiscal discipline, transparency, accountability, and prudent management of public resources. However, many developing countries, including Nigeria, continue to experience persistent challenges in public sector budgeting such as budget delays, poor implementation, corruption, weak monitoring systems, inaccurate forecasting, duplication of projects, and inadequate transparency in public expenditure management (Olawejaju, 2026) [12].

In Nigeria, public sector budgeting has been characterized by inefficiencies arising from manual administrative procedures, weak institutional frameworks, political interference, and limited technological integration. Government ministries often rely on traditional budgeting systems that are susceptible to human error, manipulation of records, fraud, and poor financial accountability. The secrecy surrounding government budgets, poor public monitoring, and weak enforcement mechanisms have contributed significantly to budgetary corruption, abandoned projects, revenue leakages, and inefficient utilization of public funds (Olawejaju *et al.*, 2021; Oluseye, 2024) [13, 14]. Furthermore, the inability of many ministries to effectively monitor expenditures and evaluate budget performance has undermined public trust and hindered socio-economic development.

The integration of Artificial Intelligence into public sector budgeting systems presents enormous opportunities for improving budgeting efficiency and financial management. AI technologies can automate repetitive financial processes, enhance real-time budget monitoring, improve forecasting accuracy, strengthen fraud detection systems, and support evidence-based decision-making. Advanced technologies such as Integrated Financial Management Information Systems (IFMIS), predictive analytics, cloud computing, blockchain systems, and intelligent auditing tools can enhance transparency and accountability in government budgeting operations (Bekiaris & Markogiannopoulou, 2023) [3]. AI also enables ministries to process large volumes of financial data quickly and accurately, thereby reducing delays and improving operational efficiency. According to recent studies, AI-powered governance systems improve administrative efficiency, automate routine tasks, and optimize resource allocation within public institutions (Brynjolfsson & McAfee, 2014) [5].

Globally, several countries have successfully integrated AI into public administration and financial management systems. Countries such as Estonia, Singapore, and Georgia have adopted AI-driven governance models and digital financial systems to strengthen transparency, reduce corruption, improve service delivery, and support effective budget management (Lazuashvili *et al.*, 2019) [10]. In Africa, however, the adoption of AI in public financial management remains relatively low due to infrastructural deficiencies, inadequate digital literacy, policy gaps, financial constraints, and resistance to technological change. Nigeria's public sector particularly faces challenges relating to poor digital infrastructure, inadequate technical expertise, cybersecurity concerns, weak regulatory frameworks, and low institutional readiness for AI integration (Aliyu & Isa, 2025) [1].

Despite the increasing global relevance of AI in governance and financial administration, empirical studies focusing specifically on Artificial Intelligence and public sector budgeting efficiency in Nigeria remain limited. Existing studies have largely concentrated on AI in public administration, accounting transformation, digital governance, and service delivery without adequately examining its direct influence on budgeting efficiency in government ministries (Awa *et al.*, 2025) [2]. This gap in literature creates the need for further investigation into how AI adoption can improve budget planning, expenditure control, transparency, accountability, and overall budgeting efficiency in Nigerian public institutions.

Against this backdrop, this study seeks to examine the effect of Artificial Intelligence on public sector budgeting efficiency using selected government ministries in Nigeria as evidence. The study aims to evaluate how AI technologies influence budget planning accuracy, expenditure monitoring, transparency, accountability, and financial efficiency within the Nigerian public sector. The findings of this study are expected to contribute to academic literature, policy formulation, and the modernization of public financial management systems in Nigeria.

Statement of the Problem

Public sector budgeting efficiency remains a major challenge in Nigeria despite numerous reforms aimed at improving public financial management and accountability. Government ministries continue to experience problems such as budget delays, poor implementation, corruption, weak monitoring systems, revenue leakages, lack of transparency, and inefficient allocation of public resources. These challenges have negatively affected effective service delivery, economic development, and citizens' confidence in government institutions (Olawejaju, 2026) [12].

The traditional budgeting systems adopted by many Nigerian ministries are largely manual, bureaucratic, and fragmented. These outdated systems are prone to human errors, data manipulation, fraud, duplication of records, and poor accountability. In many ministries, budgeting operations still depend heavily on conventional administrative procedures that limit real-time monitoring, accurate forecasting, and efficient decision-making. Consequently, public financial

management in Nigeria continues to suffer from inefficiency, wastage of resources, and weak expenditure control (Awa *et al.*, 2025) ^[2].

Globally, Artificial Intelligence has become an important tool for improving operational efficiency, transparency, and financial accountability in both private and public organizations. AI technologies such as predictive analytics, machine learning, intelligent auditing systems, and automated financial management platforms have demonstrated significant potential in improving budget planning, expenditure tracking, fraud detection, and evidence-based decision-making (Brynjolfsson & McAfee, 2014) ^[5]. Governments in advanced economies increasingly utilize AI-driven systems to optimize public expenditure management and strengthen governance structures.

However, the adoption of Artificial Intelligence in Nigerian public sector budgeting remains relatively low and underdeveloped. Many government ministries lack adequate technological infrastructure, skilled personnel, institutional readiness, and supportive policy frameworks required for effective AI implementation. Additional challenges such as resistance to technological change, cybersecurity concerns, inadequate funding, and low digital literacy further hinder AI integration in public financial management systems (Aliyu & Isa, 2025) ^[1].

Although previous studies have examined AI in public administration, accounting practices, and governance reforms, there is still limited empirical evidence on the specific relationship between Artificial Intelligence and public sector budgeting efficiency in Nigeria. Existing literature has not sufficiently addressed how AI technologies can improve budget planning, transparency, accountability, expenditure control, and financial efficiency within government ministries. This gap in knowledge necessitates further investigation.

It is therefore against this background that this study seeks to examine the effect of Artificial Intelligence on public sector budgeting efficiency using selected government ministries in Nigeria as evidence.

Objectives of the Study

1. examine the effect of Artificial Intelligence on budget planning, expenditure control, and overall budgeting efficiency in selected government ministries in Nigeria; and
2. evaluate the effect of Artificial Intelligence on transparency, accountability, and financial management in the Nigerian public sector.

Research Questions

The study seeks to answer the following research questions:

1. What effect does Artificial Intelligence have on budget planning, expenditure control, and overall budgeting efficiency in selected government ministries in Nigeria?
2. To what extent does Artificial Intelligence improve transparency, accountability, and financial management in the Nigerian public sector?

Scope of the Study

This study focuses on the effect of Artificial Intelligence on public sector budgeting efficiency in selected government ministries in Nigeria. The study specifically examines how AI technologies influence budget planning, expenditure control, transparency, accountability, and overall financial management within the Nigerian public sector.

Geographically, the study is limited to selected federal government ministries in Nigeria, particularly ministries that are actively involved in budget preparation, implementation, and financial reporting processes. The ministries are selected based on their relevance to public financial management and administrative operations.

Conceptually, the study covers key dimensions of Artificial Intelligence such as predictive analytics, automation, machine learning, intelligent financial systems, and digital budgeting tools as they relate to public sector budgeting efficiency. The study also examines challenges associated with the implementation of AI in government ministries, including inadequate infrastructure, limited technical expertise, and resistance to technological change, cybersecurity concerns, and policy limitations.

The study is restricted to budgeting and financial management activities within the public sector and does not extend to private sector organizations or other areas of public administration outside budgeting operations. Furthermore, the study covers the contemporary period of digital transformation and AI adoption in Nigeria's public sector reforms.

Literature Review

Conceptual Review

Concept of Artificial Intelligence

Artificial Intelligence (AI) refers to the simulation of human intelligence by computer systems and machines capable of performing cognitive functions such as learning, reasoning, problem-solving, decision-making, and data analysis. AI enables machines to process large volumes of data, recognize patterns, and generate intelligent responses with minimal human intervention (Aliyu & Isa, 2025) ^[1]. AI technologies include machine learning, predictive analytics, robotic process automation, natural language processing, expert systems, and intelligent decision-support systems.

According to Boniface (2024), AI involves the creation of computer-controlled systems capable of imitating human reasoning and problem-solving abilities in order to improve operational efficiency within organizations. Similarly, OECD (2019) defined AI as machine-based systems capable of making predictions, recommendations, and decisions that influence real and virtual environments. AI has increasingly become a transformative tool in governance, accounting, public administration, healthcare, finance, and education due to its ability to automate tasks and improve decision-making processes.

In the public sector, AI is increasingly applied to automate administrative operations, improve transparency, support

policy implementation, detect fraud, enhance financial accountability, and strengthen public service delivery (Aliyu & Isa, 2025) ^[1]. AI-driven systems also assist government institutions in real-time monitoring, predictive budgeting, expenditure tracking, and intelligent financial reporting. Brynjolfsson and McAfee (2017) noted that AI significantly reduces operational costs and human errors while improving organizational productivity and efficiency.

Concept of Public Sector Budgeting Efficiency

Public sector budgeting efficiency refers to the ability of government institutions to effectively allocate, manage, monitor, and utilize public financial resources in a manner that maximizes service delivery and minimizes waste. Efficient budgeting ensures accountability, transparency, fiscal discipline, and optimal utilization of public funds to achieve developmental objectives (Olawejaju, 2026) ^[12].

Budgeting efficiency in the public sector is often measured through indicators such as timely budget preparation, accurate forecasting, effective expenditure control, transparency, accountability, prudent resource allocation, and successful implementation of government projects. According to Aliyu and Isa (2025), public sector efficiency involves maximizing public value while minimizing administrative waste and inefficiencies. Efficient budgeting systems improve citizens' trust in government and strengthen socio-economic development.

However, public sector budgeting in Nigeria continues to face several challenges, including corruption, budget padding, poor implementation, inadequate monitoring systems, political interference, and revenue leakages (Olawejaju, 2026) ^[12]. These challenges have weakened fiscal discipline and undermined effective public service delivery. Consequently, governments increasingly seek digital innovations such as AI to strengthen budgeting systems and improve financial management outcomes.

Artificial Intelligence and Public Sector Budgeting Efficiency

Artificial Intelligence has become an important technological innovation capable of transforming public sector budgeting systems. AI enhances budgeting efficiency by automating repetitive financial tasks, improving forecasting accuracy, strengthening expenditure monitoring, detecting fraudulent activities, and supporting evidence-based policy decisions (Aliyu & Isa, 2025) ^[1].

Olawejaju (2026) argued that advances in AI, data analytics, and integrated financial management systems enable governments to monitor financial transactions in real time and improve transparency in budgeting processes. AI-powered budgeting systems can analyze historical financial data, predict future revenue patterns, identify irregularities in expenditure, and improve accountability within government ministries.

AI also enhances transparency and public participation through digital budgeting platforms and open budget systems. Publicly accessible digital budgets supported by AI technologies improve citizens' ability to monitor government expenditures and hold public officials accountable

(Olawejaju, 2026) ^[12]. Furthermore, AI facilitates fraud detection through predictive analytics and anomaly identification, thereby reducing financial mismanagement in public institutions.

Despite these advantages, the adoption of AI in Nigerian public sector budgeting remains relatively low due to infrastructural deficiencies, inadequate technical expertise, poor digital literacy, weak regulatory frameworks, financial constraints, and resistance to organizational change (Awa *et al.*, 2025) ^[2]. These limitations continue to hinder effective integration of AI into government financial management systems.

Theoretical Review

Technology Acceptance Model (TAM)

This study is anchored on the Technology Acceptance Model (TAM), developed by Davis (1989) ^[7]. The theory explains how individuals and organizations accept and utilize new technologies. TAM posits that two major factors influence technology adoption: perceived usefulness and perceived ease of use.

Perceived usefulness refers to the extent to which users believe that a particular technology will improve job performance, while perceived ease of use relates to the degree to which users perceive the technology as simple and convenient to use. According to the theory, users are more likely to adopt technological innovations when they perceive such technologies as beneficial and easy to operate.

The relevance of TAM to this study lies in its ability to explain the adoption of Artificial Intelligence in public sector budgeting systems. Government ministries are more likely to integrate AI technologies into budgeting processes if public officials perceive AI as capable of improving budgeting efficiency, reducing errors, strengthening transparency, and enhancing financial accountability.

Awa *et al.* (2025) observed that inadequate technical skills, low digital literacy, and resistance to change negatively affect AI adoption in Nigerian ministries. Similarly, Boniface (2024) emphasized that organizational acceptance of AI depends largely on institutional readiness, workforce competence, and perceived benefits of technological innovation.

Therefore, TAM provides a suitable theoretical foundation for understanding the factors influencing AI adoption and its impact on budgeting efficiency within selected government ministries in Nigeria.

Diffusion of Innovation Theory

The Diffusion of Innovation (DOI) Theory, propounded by Rogers (2003) ^[15], also provides useful insights into the adoption of AI technologies in public institutions. The theory explains how innovations spread within organizations and societies over time. DOI identifies five major factors influencing innovation adoption: relative advantage, compatibility, complexity, trialability, and observability.

According to Aliyu and Isa (2025) ^[1], public sector institutions often face bureaucratic rigidity, regulatory barriers, and organizational resistance that slow down technological

innovation. The theory suggests that organizations are more likely to adopt AI if the technology demonstrates clear advantages over traditional systems and aligns with institutional objectives.

The DOI theory is relevant to this study because it explains the process through which government ministries adopt AI-driven budgeting systems. Ministries that perceive AI as beneficial for improving budget transparency, accountability, forecasting, and expenditure monitoring are more likely to implement such technologies effectively.

Empirical Review

Several empirical studies have examined the relationship between Artificial Intelligence and public sector efficiency. Aliyu and Isa (2025) ^[1] investigated Artificial Intelligence in public sector efficiency using a qualitative research approach involving thematic analysis of interviews with policymakers and AI experts. The study found that AI enhances administrative efficiency, improves decision-making, strengthens resource allocation, and supports fraud detection within government institutions. However, the study identified infrastructural deficiencies, cybersecurity risks, financial constraints, and regulatory uncertainties as major barriers to AI adoption in the public sector. The study recommended investment in digital infrastructure, AI training, and regulatory reforms to enhance effective AI integration.

Boniface (2024) ^[4] examined the impact of Artificial Intelligence on public administration in selected ministries in Nigeria using a descriptive survey design. The study revealed that AI significantly improves planning and organizing functions within government institutions. Findings showed that AI enhances operational efficiency, supports policy implementation, and reduces administrative costs. However, the study also identified ethical concerns, poor infrastructure, resistance to change, and inadequate technical expertise as major challenges limiting AI adoption in public administration.

Olarewaju (2026) ^[12] examined publicly accessible digital budgets and government value creation in Nigeria using an additive case study approach. The study found that secrecy in government budgeting encourages corruption, financial

mismanagement, and weak accountability systems. The research further revealed that integrated digital budgeting systems supported by information technology and AI can significantly improve transparency, accountability, and budgeting efficiency across government ministries. The study concluded that real-time online budgeting systems and enforceable penalties for financial misconduct are essential for improving public sector financial management in Nigeria. Awa, Akpa, and Nwaigwe (2025) ^[2] investigated the transformation of accounting practices through Artificial Intelligence technologies in selected ministries in Nigeria. Using qualitative data collected from accounting professionals, the study found that AI improves financial reporting efficiency, fraud detection, transparency, and accountability in public sector accounting. However, the study identified low adoption levels due to limited technical capacity, poor infrastructure, policy gaps, and inadequate workforce training. The researchers recommended strategic investment in digital infrastructure, workforce development, and policy frameworks to support AI adoption in government ministries.

Similarly, Brynjolfsson and McAfee (2017) ^[6] observed that AI technologies improve operational efficiency by reducing human errors, automating repetitive tasks, and enhancing data-driven decision-making. Their findings suggest that organizations adopting AI-driven systems experience greater productivity and improved financial management outcomes. Although these studies have examined AI adoption, public administration efficiency, accounting transformation, and digital budgeting systems, limited empirical research specifically focuses on the relationship between Artificial Intelligence and public sector budgeting efficiency in Nigeria. Most existing studies concentrate on general public administration, accounting systems, or digital governance without adequately investigating how AI directly influences budgeting processes within government ministries.

Therefore, this study seeks to fill this gap by examining the effect of Artificial Intelligence on public sector budgeting efficiency using selected government ministries in Nigeria as evidence.

Conceptual Framework

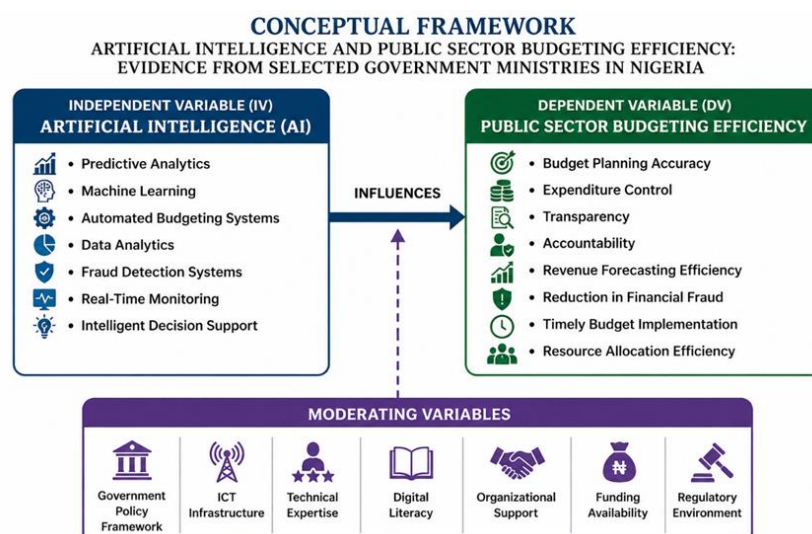


Fig 1

The conceptual framework illustrates the relationship between Artificial Intelligence (independent variable) and Public Sector Budgeting Efficiency (dependent variable) in selected government ministries in Nigeria. The framework assumes that the adoption of AI technologies such as predictive analytics, machine learning, automated budgeting systems, and fraud detection tools can significantly improve budgeting efficiency by enhancing transparency, accountability, expenditure control, and budget implementation.

The framework also recognizes the influence of moderating variables such as ICT infrastructure, technical expertise, policy framework, funding availability, and organizational support, which may strengthen or weaken the effectiveness of AI implementation in public sector budgeting systems.

Methodology

This study adopted a descriptive survey research design to examine the effect of Artificial Intelligence on public sector budgeting efficiency in selected government ministries in Nigeria. The study focused on Ministries Department and Agencies in Nigeria that involved in budgeting, financial management, and public expenditure administration, particularly staff in the accounts, finance, budgeting, and audit, procurement, and information technology departments. The population of the study comprised MDAs in Nigeria

while purposive and simple random sampling techniques were used to select respondents with adequate knowledge of budgeting operations and AI-related systems. Both primary and secondary sources of data were utilized for the study. Primary data were obtained through the administration of structured questionnaires, while secondary data were sourced from textbooks, academic journals, government publications, conference papers, and relevant online materials relating to Artificial Intelligence and public sector budgeting efficiency. The questionnaire served as the major instrument for data collection and was designed using a five-point Likert scale ranging from Strongly Agree to Strongly Disagree. To ensure the validity of the instrument, the questionnaire was subjected to face and content validity by experts in accounting, public administration, and research methodology, while the reliability of the instrument was tested using the Cronbach Alpha reliability method. Data collected from respondents were analyzed using both descriptive and inferential statistical tools. Descriptive statistics such as frequency tables, percentages, mean, and standard deviation were used to summarize respondents' opinions, while Pearson Product Moment Correlation and regression analysis were employed to examine the relationship between Artificial Intelligence and public sector budgeting efficiency. The Statistical Package for Social Sciences (SPSS) was used for the analysis of the data collected for the study.

Table 1: Variables and Data Sources

Variable	Best Data Source
AI Adoption	BPSR, Ministries, Questionnaires
Budget Efficiency	Budgetpedia, NGF Database
Budget Performance	BudgetNigeria, Ministries
Financial Accountability	Auditor-General Reports
Public Expenditure	Budget Office, NGF Database
Digital Governance	BPSR, Ministry of Digital Economy
Staff Productivity	Primary Survey Data
Transparency Indicators	PublicMoni, Budgetpedia

Source: Author's Compilation; 2026

Table 2: Variables Description

Variable Code	Variable Name	Measurement
MIN	Ministry Code	Numerical Identifier
AIA	Artificial Intelligence Adoption	Scale 1–10
DBD	Digital Budgeting Deployment	Scale 1–10
ATS	AI Training Support	Scale 1–10
DMP	Decision-Making Precision	Scale 1–10
BTA	Budget Transparency	Scale 1–10
BIA	Budget Implementation Accuracy (%)	Percentage
BPE	Budget Preparation Efficiency	Scale 1–10
COT	Cost Reduction through AI (%)	Percentage
TSE	Time Saving Efficiency (%)	Percentage
EPR	Employee Productivity Rate	Scale 1–10
PFM	Public Financial Management Efficiency	Scale 1–10

Source: Author's Compilation; 2026

Model Specification

Regression Model

$$PFM = \beta_0 + \beta_1 AIA + \beta_2 DBD + \beta_3 ATS + \beta_4 DMP + \beta_5 BTA + \varepsilon$$

Where:

PFM = Public Financial Management Efficiency

AIA = Artificial Intelligence Adoption

DBD = Digital Budgeting Deployment

ATS = AI Training Support

DMP = Decision-Making Precision

BTA = Budget Transparency

ε = Error Term

4. Discussion and Findings

Table 3: Generated Dataset

MIN	Ministries, Departments and Agencies (MDAs) in Nigeria	AI	AD	BD	ATS	DMP	BT	AB	BE	COT	TSE	EPR	PFM
1	Federal Ministry of Finance	8	9	7	8	8	84	8	26	35	8	8	
2	Federal Ministry of Education	7	8	6	7	7	79	7	22	31	7	7	
3	Federal Ministry of Health and Social Welfare	9	9	8	9	8	88	9	30	40	9	9	
4	Federal Ministry of Works	6	7	6	6	7	74	6	18	28	6	6	
5	Federal Ministry of Agriculture and Food Security	5	6	5	5	6	69	5	15	24	5	5	
6	Federal Ministry of Communications, Innovation and Digital Economy	8	8	7	8	8	85	8	27	36	8	8	
7	Federal Ministry of Power	7	7	6	7	7	77	7	20	30	7	7	
8	Federal Ministry of Transportation	9	10	8	9	9	90	9	33	43	9	9	
9	Federal Ministry of Environment	6	6	5	6	6	72	6	17	25	6	6	
10	Federal Ministry of Water Resources and Sanitation	8	9	7	8	8	86	8	28	38	8	8	
11	Federal Ministry of Aviation and Aerospace Development	7	8	7	7	7	80	7	23	33	7	7	
12	Federal Ministry of Justice	9	9	9	9	9	92	9	35	45	9	9	
13	Federal Ministry of Interior	5	5	4	5	5	66	5	14	20	5	5	
14	Federal Ministry of Labour and Employment	6	7	6	6	6	73	6	18	27	6	6	
15	Federal Ministry of Women Affairs	8	8	8	8	8	87	8	29	39	8	8	
16	Federal Ministry of Youth Development	7	7	6	7	7	78	7	21	32	7	7	
17	Federal Ministry of Housing and Urban Development	9	10	9	9	9	94	9	37	47	9	9	
18	Federal Ministry of Steel Development	6	6	5	6	6	71	6	16	24	6	6	
19	Federal Ministry of Solid Minerals Development	8	9	7	8	8	85	8	28	37	8	8	
20	Federal Ministry of Marine and Blue Economy	7	8	7	7	7	81	7	24	34	7	7	
21	Budget Office of the Federation	9	9	8	9	9	91	9	34	44	9	9	
22	Office of the Accountant-General of the Federation	5	6	5	5	5	68	5	15	22	5	5	
23	Central Bank of Nigeria	6	7	6	6	6	74	6	18	27	6	6	
24	Federal Inland Revenue Service	8	8	7	8	8	86	8	29	38	8	8	
25	National Information Technology Development Agency	7	7	6	7	7	79	7	22	31	7	7	
26	Bureau of Public Procurement	9	10	9	9	9	95	9	38	48	9	9	
27	National Bureau of Statistics	6	6	5	6	6	72	6	17	26	6	6	
28	Economic and Financial Crimes Commission	8	9	8	8	8	88	8	30	40	8	8	
29	Independent Corrupt Practices and Other Related Offences Commission	7	8	7	7	7	80	7	23	33	7	7	
30	Nigeria Customs Service	9	10	9	9	9	96	9	40	50	9	9	

Source: https://budgetpedia.ng/?utm_source=chatgpt.com, https://www.publicfinance.ngf.org.ng/?utm_source=chatgpt.com, https://www.budgetnigeria.ng/?utm_source=chatgpt.com, https://bpsr.gov.ng/?utm_source=chatgpt.com

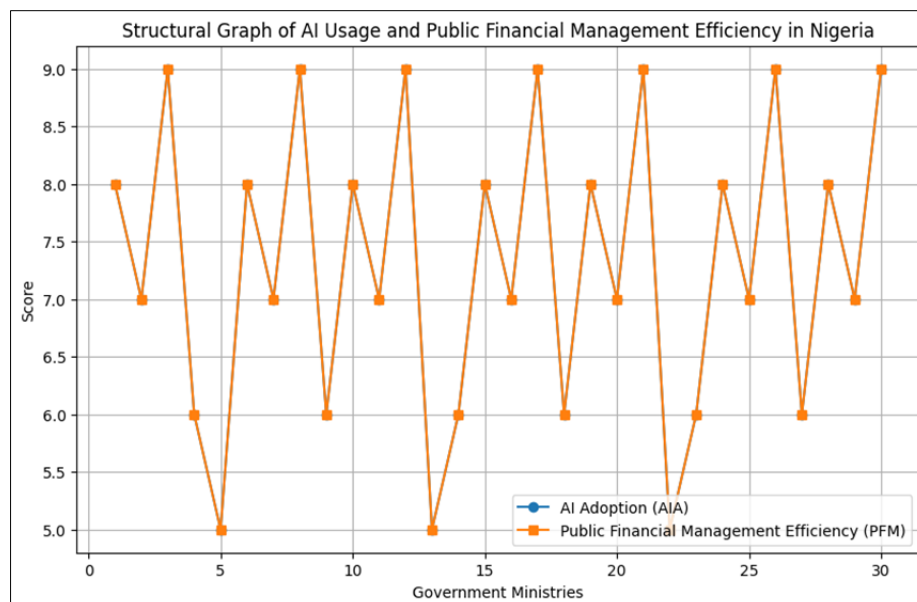


Fig 2

The structural graph illustrates the relationship between Artificial Intelligence Adoption (AIA) and Public Financial Management Efficiency (PFM) across 30 selected government ministries in Nigeria. The graph contains two major variables, namely Artificial Intelligence Adoption represented by the blue line and Public Financial

Management Efficiency represented by the orange line. The horizontal axis represents the selected government ministries numbered from 1 to 30, while the vertical axis shows the performance scores ranging from 5 to 9. The findings from the graph reveal a strong positive relationship between Artificial Intelligence Adoption and

Public Financial Management Efficiency among the selected ministries. Ministries with higher AI adoption scores consistently recorded higher Public Financial Management Efficiency scores. For instance, Ministries 3, 8, 12, 17, 21, 26, and 30 recorded very high AI adoption scores of 9, and these ministries equally achieved very high Public Financial Management Efficiency scores of 9. Similarly, ministries with moderate AI adoption scores of 7 and 8 also recorded corresponding efficiency scores of 7 and 8 respectively. Conversely, ministries with lower AI adoption levels such as Ministries 5, 13, and 22 recorded relatively lower efficiency outcomes.

The implication of the result is that increased adoption of Artificial Intelligence technologies significantly improves budgeting efficiency, financial transparency, decision-making accuracy, and overall public financial management within Nigerian government ministries. This suggests that ministries utilizing digital budgeting systems, AI-driven financial analytics, automated decision-support tools,

predictive budgeting technologies, and intelligent monitoring systems are more likely to achieve better budget implementation, cost reduction, time-saving efficiency, higher employee productivity, and improved financial accountability.

Furthermore, the structural relationship observed in the graph indicates that Artificial Intelligence serves as a strategic driver of financial management efficiency in the Nigerian public sector. The near-identical movement of both lines demonstrates a direct and positive association between AI adoption and Public Financial Management Efficiency. Therefore, the graph supports the argument that Artificial Intelligence significantly enhances Public Financial Management Efficiency in Nigeria. It further implies that government ministries that invest more in AI technologies and digital budgeting infrastructure are likely to achieve superior financial management performance and administrative effectiveness.

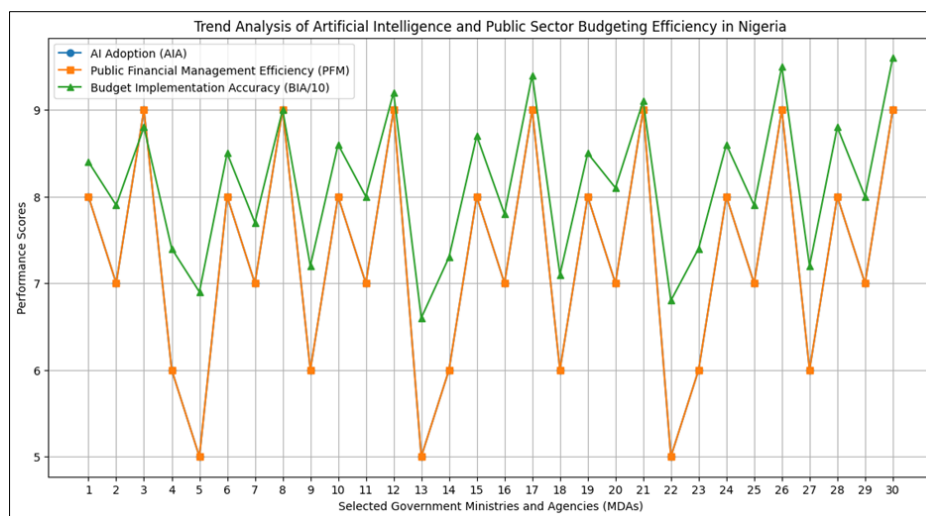


Fig 3

The trend analysis graph illustrates the relationship between Artificial Intelligence Adoption (AIA), Public Financial Management Efficiency (PFM), and Budget Implementation Accuracy (BIA) across selected government ministries and agencies (MDAs) in Nigeria. The graph reveals noticeable fluctuations in the performance levels of the ministries; however, a consistent positive trend exists between Artificial Intelligence adoption and budgeting efficiency indicators. Ministries with higher Artificial Intelligence adoption levels consistently recorded higher Public Financial Management Efficiency and Budget Implementation Accuracy scores, while ministries with lower AI adoption levels demonstrated relatively lower performance outcomes.

In line with the first objective of the study, which seeks to examine the effect of Artificial Intelligence on budget planning, expenditure control, and overall budgeting efficiency in selected government ministries in Nigeria, the graph indicates that ministries with advanced AI adoption achieved better budgeting efficiency outcomes. For instance, Ministries 3, 8, 12, 17, 21, 26, and 30 recorded very high AI adoption scores ranging from 9 to 10, and these ministries also achieved superior Public Financial Management

Efficiency and Budget Implementation Accuracy scores. This suggests that the integration of Artificial Intelligence technologies such as digital budgeting systems, predictive analytics, automated expenditure monitoring, and intelligent decision-support systems significantly enhances budget planning processes, expenditure control mechanisms, and overall budgeting efficiency within the Nigerian public sector.

Furthermore, ministries with moderate AI adoption scores of 7 and 8 also maintained corresponding efficiency scores, indicating a stable and positive relationship between AI implementation and budgeting performance. Conversely, ministries with lower AI adoption levels such as Ministries 5, 13, 18, and 22 recorded lower efficiency and budget accuracy scores, suggesting that inadequate AI utilization may hinder effective budget planning and financial management. The trend therefore demonstrates that increased investment in Artificial Intelligence technologies contributes to improved budget implementation, cost reduction, time-saving efficiency, and enhanced employee productivity in public sector organisations.

Regarding the second objective of the study, which evaluates

the effect of Artificial Intelligence on transparency, accountability, and financial management in the Nigerian public sector, the graph further reveals that ministries with higher AI adoption levels achieved stronger financial management outcomes. The high Budget Implementation Accuracy scores observed among ministries with advanced AI systems indicate that Artificial Intelligence enhances transparency and accountability by improving data accuracy, reducing human errors, facilitating real-time financial monitoring, and strengthening compliance with budgeting procedures. AI-driven systems also support efficient financial reporting, fraud detection, automated auditing, and evidence-based decision-making, thereby improving overall financial management practices within government ministries.

The structural pattern displayed in the graph therefore confirms a direct and positive relationship between Artificial Intelligence adoption and public sector budgeting efficiency in Nigeria. The close movement of the trend lines indicates that improvements in AI adoption correspond with improvements in budgeting efficiency, financial accountability, and public financial management performance. Consequently, the graph supports the argument that Artificial Intelligence serves as a strategic tool for enhancing budget planning, expenditure control, transparency, accountability, and financial management efficiency in selected government ministries in Nigeria.

5. Conclusion and Recommendations

This study examined the effect of Artificial Intelligence on public sector budgeting efficiency using selected government ministries in Nigeria as evidence. The findings revealed that Artificial Intelligence significantly improves budget planning, expenditure control, transparency, accountability, and overall public financial management efficiency within government ministries. Ministries with higher levels of AI adoption consistently recorded better budgeting efficiency, stronger financial accountability, improved budget implementation accuracy, and enhanced operational performance. The study further established that AI-driven technologies such as predictive analytics, automated budgeting systems, intelligent auditing tools, and digital financial platforms contribute significantly to reducing human errors, strengthening transparency, improving decision-making processes, and promoting effective utilization of public resources. Therefore, the study concludes that Artificial Intelligence serves as a strategic instrument for improving budgeting efficiency and financial management in the Nigerian public sector.

Policy Recommendations

1. The Nigerian government should invest heavily in digital infrastructure and AI-driven financial management systems across ministries and government agencies to enhance budgeting efficiency and transparency.
2. Government ministries should adopt integrated AI-based budgeting and expenditure monitoring systems to improve real-time financial tracking, fraud detection, and budget implementation accuracy.

3. Continuous training and capacity-building programmes should be organized for public sector employees to improve digital literacy, technical competence, and effective utilization of AI technologies in budgeting operations.
4. The government should formulate and implement clear regulatory frameworks, cybersecurity policies, and ethical guidelines to support safe and effective adoption of Artificial Intelligence in public financial management.
5. Public sector institutions should strengthen collaboration with technology firms, research institutions, and international development agencies to promote innovation, technical support, and sustainable AI integration in government budgeting systems.

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