

Digital Transformation and Performance of E-service Businesses in West Africa

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Abstract: In an era where digital innovation is essential for enhancing service delivery and competitiveness, understanding how these technologies influence firm performance is both timely and critical. Thus, this study examined the effect of digital transformation on the performance of e-service businesses in West Africa. Digital transformation was viewed using two dimensions: Artificial Intelligence (AI) adoption and cloud computing adoption. A cross-sectional survey research design was adopted to collect quantitative data from 348 owners and managers of e-service businesses across Nigeria, Ghana, Senegal, Côte d'Ivoire, and Sierra Leone using purposive sampling. Data were gathered through digitally administered structured questionnaires and analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM) with SmartPLS. The findings revealed that AI adoption had a positive and significant effect on the performance of e-service businesses, particularly in terms of service efficiency, customer experience, and decision-making processes. Similarly, cloud computing adoption demonstrated a positive and significant effect on organisational performance. These findings indicate that digital technologies are not merely supportive tools but strategic resources that enable firms to achieve sustainable competitive advantage in the rapidly evolving West African digital economy. The study contributes to the growing literature on digital transformation by providing empirical evidence from e-service businesses across five West African countries, thereby extending existing studies that have largely focused on broader SME contexts.

Keywords: Digital Transformation, Artificial Intelligence, Cloud Computing, E-Service Businesses, Performance, West Africa.

1. Introduction

Globally, enhancing e-service business performance through digital transformation has become a major concern for scholars and practitioners. In West Africa, this transformation has accelerated due to increased internet penetration, mobile connectivity, and the expansion of digital platforms across finance, education, and commerce. The growth of e-service businesses has significantly contributed to economic activities and improved access to services in the region. This is because digital connectivity and platform-based services are expanding rapidly across West Africa, supporting inclusive growth and innovation (Lawal & Abdulyekeen, 2025).

Artificial Intelligence (AI) and cloud computing have emerged as key dimensions of digital transformation. AI uses algorithms and machine learning to automate processes, enhance decision-making, and generate predictive insights, while cloud computing provides internet-based storage, servers, and software that enable firms to scale operations without heavy capital investment. Their adoption is widely recognised as a major driver of productivity, innovation, and competitiveness in the digital economy (Arachie et al., 2025).

In West Africa, AI is used in fintech, customer service automation, and fraud detection, while cloud computing supports scalable platforms and cross-border service delivery. These technologies reduce operational costs, improve efficiency, and enhance service delivery, while also enabling data storage and analytics for innovation (Lawal & Abdulyekeen, 2025).

Despite these benefits, challenges such as weak digital infrastructure, limited technical skills, regulatory uncertainties, and cybersecurity concerns continue to hinder digital adoption. In addition, disparities in digital literacy and internet access limit the full benefits of digital transformation (World Bank, 2024).

1.1 Statement of the Problem

Despite the rapid growth of digital technologies in West Africa, the adoption of digital transformation in e-service businesses remains inadequate. While some firms have improved efficiency, customer reach, and innovation through digital tools, many have not fully integrated AI and cloud computing into their operations (Mkhize et al., 2025; Akinriwa et al., 2025). This limits competitiveness and service accessibility.

Across Nigeria, Ghana, Senegal, Côte d'Ivoire, and Sierra Leone, infrastructural limitations, weak digital literacy, high costs, and regulatory challenges continue to affect digital adoption (Lawal & Abdulyekeen, 2025). Unreliable internet access and weak data protection frameworks also create uncertainty for digital investment (Lawal, 2025).

Although previous studies have demonstrated the importance of AI and cloud computing for organisational performance, most have concentrated on SMEs generally or on specific sectors, with limited emphasis on e-service businesses operating across multiple West African countries.

1.2 Objectives of the Study

The general objective of this study is to examine the effect of digital transformation on the performance of e-service businesses in West Africa. The specific objectives are to:

- i. assess the effect of Artificial Intelligence adoption on the performance of e-service businesses in West Africa.
- ii. evaluate the effect of cloud computing adoption on the performance of e-service businesses in West Africa.

1.3 Research Hypotheses

H₀₁: Artificial Intelligence adoption has no significant effect on the performance of e-service businesses in West Africa.

H₀₂: Cloud computing adoption has no significant effect on the performance of e-service businesses in West Africa.

1.4 Performance

Performance refers to the extent to which an organization achieves its objectives efficiently and effectively, including productivity, quality, profitability, and value creation (Taouab & Issor, 2019). In e-service businesses, performance is measured through effective service delivery, operational efficiency, customer satisfaction, and competitiveness (Barba-Sánchez et al., 2024). For the purpose of this study, performance is assessed through indicators including operational efficiency, service delivery, customer experience, and decision-making effectiveness, reflecting the multidimensional outcomes of digital transformation in e-service businesses. These performance dimensions are influenced by digital technologies such as Artificial Intelligence (AI) and cloud computing (Mkhize et al., 2025).

1.5 Digital Transformation, AI and Cloud Computing

Digital transformation refers to the integration of digital technologies into business operations (Verhoef et al., 2021). In West Africa, it enables e-service businesses to improve service delivery, expand customer reach, and enhance operational efficiency. In this study, digital transformation is operationalised through two key dimensions: Artificial Intelligence and cloud computing.

Artificial Intelligence refers to the simulation of human intelligence by machines, enabling learning, problem-solving, and decision-making. It is widely used to automate operations, enhance customer engagement, and support data-driven decision-making (Russell & Norvig, 2021).

Cloud computing refers to the delivery of computing services through the internet, enabling scalable and cost-effective infrastructure (Marston et al., 2011). It enables firms to scale operations, manage data efficiently, improve reliability, and support the integration of AI technologies (Barba-Sánchez et al., 2024).

1.6 Empirical Review

Lawal and Abdulyekeen (2025) examined the effect of cloud computing and AI adoption on operational efficiency among SMEs in West Africa, focusing on Nigeria, Ghana, and Senegal. Using a mixed-methods approach involving literature review, surveys, and interviews, the study assessed how both technologies influence scalability, cost efficiency, decision-making, and automation. Findings revealed that cloud computing and AI significantly improved SMEs' ability to scale operations, enhance data management, automate processes, and reduce infrastructure costs ($p < 0.05$). The study concluded that both technologies are key enablers of operational performance, although outcomes are influenced by infrastructure quality, digital skills, and affordability constraints. While this study provides valuable evidence on SMEs, it primarily focuses on operational efficiency. The present study extends this line of inquiry by examining the broader performance of e-service businesses across five West African countries using a PLS-SEM approach.

Akinboyo (2025) investigated AI adoption and firm performance in Nigerian commercial banks using a quantitative survey of 200 professionals. The study found that AI tools such as machine learning, automated

customer service, and predictive analytics significantly improved operational efficiency ($\beta = 0.54$, $p < 0.01$) and service quality ($\beta = 0.47$, $p < 0.05$). It concluded that AI enhances performance through automation and data-driven decision-making, although its banking-sector focus limits broader applicability.

1.7 Theoretical Framework

1.7.1 Resource-Based View (RBV)

This study is anchored in the Resource-Based View (RBV), which emphasises firm-specific resources and capabilities as drivers of competitive advantage (Barney, 1991). Artificial Intelligence (AI) and cloud computing are conceptualised as strategic resources that enhance operational efficiency, innovation, decision-making, and service delivery in e-service businesses. However, managerial competence, digital skills, organisational culture, and external factors such as infrastructure, regulation, and market conditions in West Africa may influence the extent to which these resources generate competitive advantage (Verhoef et al., 2021).

2. Methodology

A cross-sectional survey research design was employed to examine the effect of digital transformation on the performance of e-service businesses in five West African countries (Nigeria, Ghana, Senegal, Côte d'Ivoire, and Sierra Leone).

Purposive sampling was used to select 380 owners and managers of identifiable e-service businesses across the five countries. The sampling frame was developed from accessible e-service firms identified through business directories, digital platforms, fintech associations, and professional networks. The selection focused on firms actively utilising digital platforms in service delivery. The distribution of respondents comprised Nigeria (120), Ghana (80), Senegal (60), Côte d'Ivoire (70), and Sierra Leone (50).

A total of 380 questionnaires were administered digitally, of which 348 (91.6%) were completed and found suitable for analysis. The questionnaire comprised items adapted from previously validated instruments. Items measuring AI adoption were adapted from Akinboyo (2025) and Arachie et al. (2025), while items measuring cloud computing adoption were adapted from Ansong and Boateng (2023). All items were measured using a five-point Likert scale. A pilot study involving 30 respondents in Nigeria was conducted to assess the clarity and reliability of the instrument. Minor revisions were subsequently made, and Cronbach's Alpha values for all constructs exceeded the recommended threshold of 0.70, indicating acceptable internal consistency.

Table 1: Sampling Frame and Sample Distribution

S/N	Country	Sampling Frame (Accessible E-Service Business Owners/Managers)	Questionnaires Distributed	Questionnaires Retrieved & Valid
1	Nigeria	120	120	110
2	Ghana	80	80	74
3	Senegal	60	60	55
4	Côte d'Ivoire	70	70	65
5	Sierra Leone	50	50	44
	Total	380	380	348

Source: Field Survey (2025).

Table 1 showed the sampling frame and sample distribution across the five selected West African countries. Nigeria accounted for 120 respondents (31.6%), Ghana 80 (21.1%), Senegal 60 (15.8%), Côte d'Ivoire 70 (18.4%), and Sierra Leone 50 (13.2%). Of the 380 questionnaires distributed, 348 were valid and used for analysis, representing a response rate of 91.6%, which indicates strong participation.

PLS-SEM was employed for data analysis because of its predictive capability and its suitability for analysing complex relationships involving latent constructs. To minimise common method bias, measurement items were adapted from validated instruments, organised into separate sections, and respondent anonymity was assured.

Furthermore, Variance Inflation Factor (VIF) and full collinearity assessments conducted in SmartPLS confirmed that common method bias and multicollinearity were not significant concerns.

The structural model used was follows:

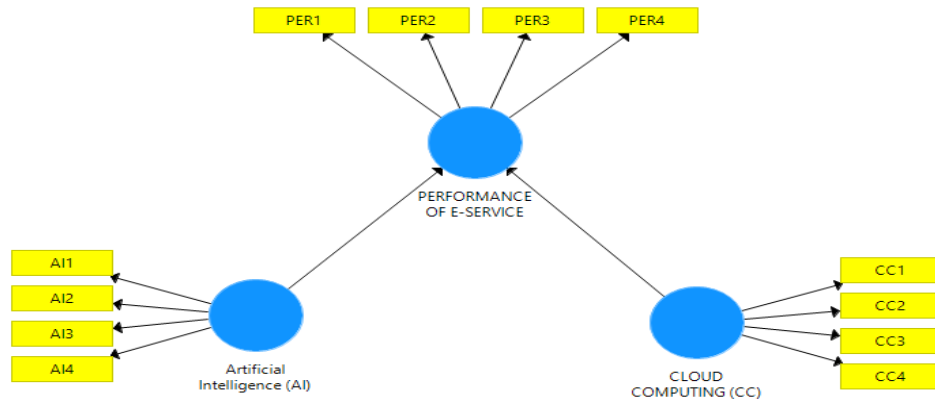


Figure 1: structural Model

Source: SmartPLS Output (2025).

3. Data Analysis

Table 2: Response Rate of Respondents

	Number of Questionnaires Administered	Number of Questionnaires Completed	Number of Questionnaires Not Completed or Returned	Number of Questionnaires Used for Analysis	Total
Number	380	348	32	348	380
Percentage	100%	91.6%	8.4%	91.6%	100%

Source: Field Survey, 2025.

Table 2 shows the response rate from 380 owners and managers of e-service businesses across Nigeria, Ghana, Senegal, Côte d'Ivoire, and Sierra Leone. Of these, 348 (91.6%) were completed and valid for analysis, while 32 (8.4%) were incomplete.

3.1 Evaluation of Measurement Model

To evaluate the measurement model, the outer loadings of the measurement items were analysed. According to Hair et al. (2021), a loading value exceeding 0.70 indicates that the construct explains more than 50% of the variance in the corresponding indicator, thereby demonstrating satisfactory indicator reliability.

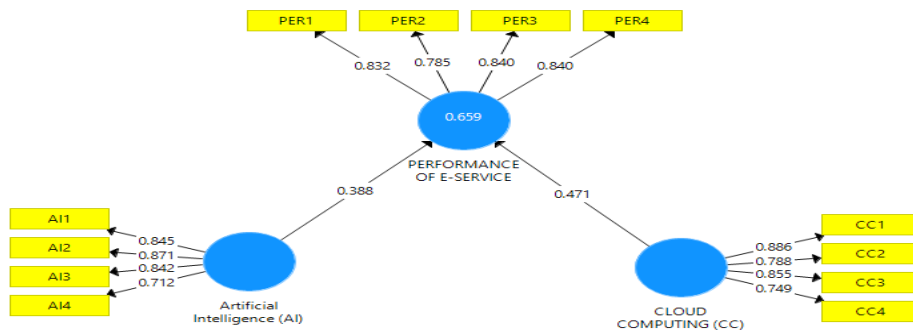


Figure 2: Measurement Model

Source: SmartPLS Output (2025).

3.2 Assessment of the Structural Model

Hair et al. (2021) recommend assessing the structural model using the coefficient of determination (R^2), path coefficients (β), and t-values obtained through bootstrapping (5,000 resamples) to evaluate the model's predictive power and determine the significance of the hypothesised relationships.

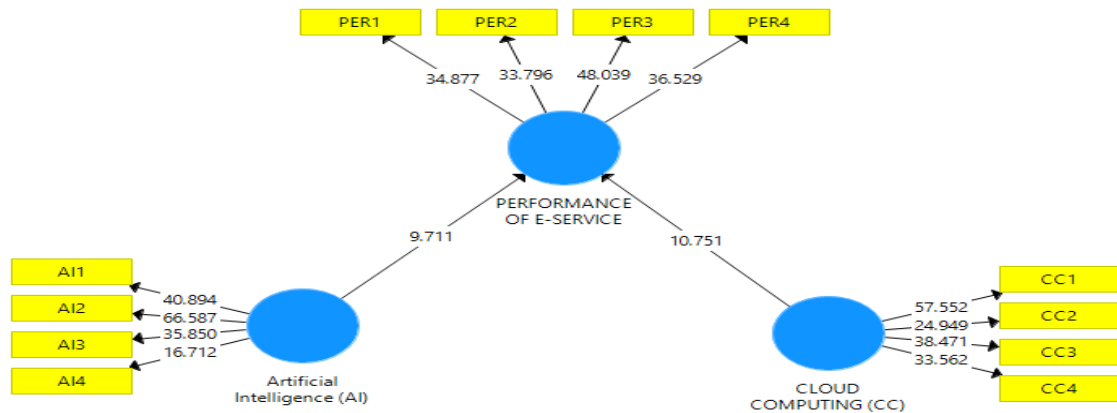


Figure 3: Structural Model Assessment

Source: SmartPLS Output (2025).

3.3 Assessment of the Coefficient of Determination (R^2)

The R^2 value of 0.659 (see Figure 2) indicates that Artificial Intelligence (AI) and cloud computing jointly explain 65.9% of the variance in organisational performance, suggesting substantial predictive power. The remaining 34.1% of the variance may be attributed to other factors not included in the model, such as regulatory conditions, infrastructure, and other organisational or environmental influences.

Table 3: Descriptive Statistics, Reliability, Convergent Validity, and Collinearity Assessment

Variable	Mean	Standard Deviation	Cronbach's Alpha	Composite Reliability	AVE	VIF
Artificial Intelligence (AI)	3.9321	0.34538	0.837	0.891	0.672	2.056
Cloud Computing (CC)	4.4248	0.32145	0.837	0.892	0.675	3.253
Performance (PER)	3.8974	0.33732	0.843	0.894	0.679	-

Sample Size (n) = 348

Source: SmartPLS Output (2025).

Table 3 presents the descriptive statistics, reliability, convergent validity, and collinearity assessment of the study constructs. The mean scores ranged from 3.8974 to 4.4248, indicating that respondents generally expressed positive perceptions of AI adoption, cloud computing, and organisational performance. Cronbach's Alpha values ranged from 0.837 to 0.843, while Composite Reliability values ranged from 0.891 to 0.894, exceeding the recommended threshold of 0.70, thereby confirming satisfactory internal consistency (Hair et al., 2021). Similarly, the Average Variance Extracted (AVE) values ranged from 0.672 to 0.679, exceeding the recommended minimum of 0.50, which confirms adequate convergent validity. Furthermore, the Variance Inflation Factor (VIF) values of 2.056 and 3.253 were below the recommended threshold of 5.0, indicating that multicollinearity was not a concern.

Table 4: Discriminant Validity (HTMT), Effect Size (f^2), and Hypotheses Testing Results**Panel A: Heterotrait-Monotrait Ratio (HTMT)**

Variable	AI	CC	PER
Artificial Intelligence (AI)	-		
Cloud Computing (CC)	0.620	-	
Performance (PER)	0.757	0.775	-

Source: SmartPLS Output (2025).

Panel B: Effect Size (f^2)

Relationship	f^2	Intepretation
AI > Peformance	0.184	Medium
Cloud Computing > Performance	0.310	Medium

(interpretation based on Cohen, 1988).

Panel C: Hypotheses Testing

Hypothesis	β	t-value	p-value	Decision
H ₀₁ : Artificial Intelligence > Performance	0.388	9.711	0.000	Rejected
H ₀₂ : Cloud Computing > Performance	0.471	10.751	0.000	Rejected

Source: SmartPLS Output (2025).

Table 4 presents the results of the discriminant validity, effect size, and hypothesis testing analyses. The HTMT values ranged from 0.620 to 0.775, all of which were below the recommended threshold of 0.85, indicating satisfactory discriminant validity (Henseler, 2017). The effect size (f^2) values of 0.184 for AI and 0.310 for cloud computing indicate medium effects on organisational performance based on Cohen's (1988) guidelines.

The hypothesis testing results further show that Artificial Intelligence had a significant positive effect on organisational performance ($\beta = 0.388$, $t = 9.711$, $p < 0.001$), leading to the rejection of H₀₁. Similarly, Cloud Computing had a significant positive effect on organisational performance ($\beta = 0.471$, $t = 10.751$, $p < 0.001$), resulting in the rejection of H₀₂.

4. Discussion of Findings

The findings revealed that Artificial Intelligence (AI) adoption has a significant positive effect on the performance of e-service businesses in West Africa ($\beta = 0.388$, $p < 0.05$), indicating that increased AI adoption enhances operational efficiency, decision-making, and service innovation. This finding is consistent with Akinboyo (2025) and Arachie et al. (2025), who reported that AI improves organisational performance through automation and data-driven decision-making. Similarly, cloud computing adoption exerted a stronger positive effect on organisational performance ($\beta = 0.471$, $p < 0.05$), suggesting that cloud technologies improve scalability, flexibility, and cost efficiency. This finding aligns with Lawal and Abdulyekeen (2025) and Ansong and Boateng (2023), who identified cloud computing as a key driver of organisational performance.

4.1 Limitations of the Study

This study has several limitations that should be considered when interpreting the findings. Firstly, the cross-sectional research design captured respondents' perceptions at a single point in time and therefore does not establish causal relationships. Also, the use of purposive sampling may limit the generalisability of the findings beyond the selected e-service businesses in the five West African countries. In addition, the study relied on self-reported data, which may be subject to response bias despite the measures taken to minimise common method bias.

5. Conclusion

This study examined the effect of digital transformation on the performance of e-service businesses in West Africa using Artificial Intelligence (AI) and cloud computing as key dimensions. The findings revealed that both technologies significantly improve organisational performance, with cloud computing exerting a stronger effect. This suggests that scalable digital infrastructure plays a critical role in enhancing operational efficiency, data management, and service delivery.

5.1 Recommendations

- i. E-service businesses should increase investment in Artificial Intelligence (AI) technologies to enhance automation, customer experience, and data-driven decision-making. Greater AI adoption will improve operational efficiency, strengthen decision quality, promote service innovation, and enhance competitiveness in increasingly dynamic digital markets.
- ii. E-service businesses should adopt and expand cloud computing platforms to improve scalability, operational efficiency, and cost management. Increased cloud computing adoption will enable flexible resource utilisation, reduce infrastructure costs, enhance data accessibility, and support seamless service delivery, thereby improving overall organisational performance.

Ethics Declaration

Ethical approval was obtained prior to data collection, ensuring compliance with research ethics. Participation was voluntary, with informed consent obtained from respondents. Confidentiality and anonymity were maintained, and data were used solely for academic purposes.

AI Declaration

Artificial Intelligence (AI) tools were used to support writing, editing, and clarity in this study. However, all conceptualization, data analysis, and interpretation were conducted independently by the author. AI was not used to generate data or alter findings, and all sources were properly verified and referenced.

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