Journal of Finance and Accounting, 2026, Vol. 14, No. 1, 1-11
Available online at http://pubs.sciepub.com/jfa/14/1/1
Published by Science and Education Publishing
DOI:10.12691/jfa-14-1-1

A Panel Data Analysis of the Impact of Cloud Accounting on the Performance of Nigerian Consumer Goods Companies: A Fully Modified OLS Approach

AGBEYANGI Babatunde. A.[1,*], AKINDE Mukail A.[2], OGUNNUSI Oluwatobi. N.[3]

[1]Department of Accountancy, Federal Polytechnic, Ilaro, Nigeria
[2]Department of Taxation, Federal Polytechnic, Ilaro, Nigeria
[3]Department of Mathematics and Statistics, Federal Polytechnic, Ilaro, Nigeria
*Corresponding author: babatunde.agbeyangi@federalpolyilaro.edu.ng

Received June 13, 2026; Revised July 15, 2026; Accepted July 22, 2026

Abstract: Cloud accounting has emerged as a critical component of digital transformation, enabling firms to improve financial reporting, operational efficiency, and decision-making processes. This study examines the long-run impact of cloud accounting investments on the performance of selected consumer goods companies in Nigeria. Using a quantitative panel data approach, secondary data were obtained from ten listed consumer goods companies over the period 2014–2023. The study employed cost of software and cost of training as proxies for cloud accounting investment, and Return on Assets (ROA) and Return on Equity (ROE) as measures of firm performance. Panel unit root and Pedroni cointegration tests were conducted to establish the statistical properties and long-run relationships among the variables, while Fully Modified Ordinary Least Squares (FMOLS) technique was used for estimation. The findings revealed that software costs exert a positive and significant effect on return on equity, indicating that investments in cloud accounting technology enhance shareholder's value. Conversely, training costs have a significant negative effect on return on assets and a marginal negative effect on return on equity, thereby suggesting that short-term financial burden of training may outweigh its immediate benefits. The study also confirms the existence of a stable long-run relationship between cloud accounting investments and firm performance. The findings highlight the need for firms to optimize cloud accounting investment decisions to maximize performance outcomes

Keywords: *Cloud Accounting, Cointegration, Fully Modified Ordinary Least Squares, Return on Asset, Return on Equity*

Cite This Article: AGBEYANGI Babatunde. A., AKINDE Mukail A.X, and OGUNNUSI Oluwatobi. N., "A Panel Data Analysis of the Impact of Cloud Accounting on the Performance of Nigerian Consumer Goods Companies: A Fully Modified OLS Approach." *Journal of Finance and Accounting*, vol. 14, no. 1 (2026): 1-11. doi: 10.12691/jfa-14-1-1.

1. Introduction

Digital technologies have revolutionized accounting practices globally, dramatically changing the way financial information is created, handled, stored and shared. In today's digital age, businesses are increasingly adopting cutting-edge accounting technologies to streamline repetitive accounting tasks, aid in informed business decisions, boost efficiency in reporting, and enable predictive analytics for strategic planning. Cloud computing, artificial intelligence, blockchain, big data analytics, and machine learning are among the emerging technologies that are transforming accounting practices and driving businesses to greater efficiency, transparency, and competitiveness in today's digital landscape [1,2,3]. This means that in today's twenty-first century, accounting professionals and organizations are faced with constant need to adjust to technological advancements and become current and responsive to the changing expectations and requirements of stakeholders and regulators.

One of the biggest changes in the field of accounting in the modern era is cloud accounting, which has made accounting systems internet-based and thus enables real-time access to the financial information. Cloud accounting allows organizations to move away from a paper-based and desktop accounting system to fully integrated online system providing access to accounting information anytime, anywhere [4]. Cloud-based solutions allow secure storage, processing, and sharing of financial information online, improving collaboration between accountants, managers, investors, auditors, and other stakeholders [5]. This facilitates quicker decision making, ease transparency, greater flexibility in operations and more efficient business processes.

The evolution of cloud accounting technology has gone hand-in-hand with the rise in the use of cloud accounting.

Reference [6] define cloud computing as a delivery of hosted services via the Internet and include three types: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). In these models, organizations can leverage computing services like servers, storage, databases, software, networking, analytics, and security without significant investments in physical hardware and software upkeep. Thus, applications and services can be accessed remotely from the cloud, without the need for a large amount of IT infrastructure investments. Reference [7] state that because cloud computing has had a profound impact on how data is managed, information is accessed, and businesses operate. It has emerged as an essential bedrock in economic advancement.

Cloud accounting is different from traditional accounting which depend on software installation and maintenance on local computers and the use of the internet and web browsers or mobile applications [8]. The technology helps companies to streamline accounting processes, provide live reporting, ensure strong internal controls, secure financial data and manage finances as a team between multiple locations. As financial information piles up and becomes more complicated, cloud accounting solution is becoming an essential solution for accounting efficiency and enabling optimal management decisions [9].

While there are many benefits to cloud accounting, it comes with a few difficulties as well. However, organizations planning to move to cloud-based accounting systems need to consider issues such as software acquisition costs, employee training needs, cyber risks, data privacy, system reliability, and integration with the existing business processes [2,10]. However, lack of technological infrastructure, insufficient digital literacy, resistance to change, and security issues are also a concern for sensitive financial data in cloud servers, in many developing countries, thus creating further hurdles to the adoption of cloud accounting. Reference [11] suggest that cloud accounting has a positive impact on the formation of human capital, structural capital and relational capital, thereby creating competitiveness and performance among companies in the long term.

Cloud accounting is a strategy that has been increasingly supported by recent empirical evidence. According to reference [12], cloud accounting greatly enhances the quality of financial information in firms in Nigeria by making their accounting reports accurate, timely and reliable. Likewise, [10] found that listed food and beverage companies in Nigeria are greatly affected by the cost components of cloud accounting, especially the software cost and training cost. Reference [13] noted that cloud accounting positively impacts on financial reporting quality of deposit money banks in Nigeria. Also, reference [14] found positive relationships between cloud-based accounting systems and intellectual capital and business performance among SMEs, while [15] reported high positive relationships between cloud accounting and financial performance among firms in Indore.

Recent research keeps reinforcing the importance of cloud accounting in boosting organisational performance. Reference [16] reported that investment in adequate digital infrastructure and cybersecurity of listed companies has a significant impact on the quality of financial reporting in the presence of the use of cloud-based accounting information systems. Similarly, reference [17] confirmed that the implementation of cloud accounting will significantly improve financial performance in the banking sector of Bangladesh, and [18] found that the cloud computing capability is positively associated with financial management practices and organizational performance of the businesses in Vietnam. In addition, studies showed that the use of cloud accounting will improve business flexibility, operational efficiency, decision making quality, and overall business competitiveness [19,20,21].

Despite the emergence of literature, majority of current research has been on cloud adoption, the effectiveness of accounting information systems, financial reporting quality, and SME performance. Little research studies have examined the effects of the individual costs of cloud accounting on firm profitability. Also, few evidence has been drawn from developed economies, and there is still relatively few evidence on cloud accounting learning process in Nigeria and other developing economies. Furthermore, in Nigeria, existing studies have focused largely on the banking sector and SMEs and food and beverage companies, and largely overlooked the wider consumer goods sector. Lastly, few studies analysed the impact of software costs and training costs on return on assets and return on equity in the same study, with the use of strong long run panel estimation method like Fully Modified Ordinary Least Squares (FMOLS).

This study seeks to bridge these gaps by examining the impact of cloud accounting on the performance of selected consumer goods companies in Nigeria. Specifically, the study focuses on the cost of software and the cost of training as key cloud accounting investment indicators, while return on assets (ROA) and return on equity (ROE) serve as measures of firm performance. To achieve this, the objectives seek to: (i) examine the impact of the cost of software on return on assets of selected consumer goods companies in Nigeria; (ii) investigate the impact of the cost of training on return on assets of selected consumer goods companies in Nigeria; (iii) assess the impact of the cost of software on return on equity of selected consumer goods companies in Nigeria; and (iv) examine the impact of the cost of training on return on equity of selected consumer goods companies in Nigeria.

2. Literature Review

2.1. Conceptual Review

2.1.1. Cloud Accounting

Cloud accounting entails an accounting system using technologies whereby an organization is able to perform accounting activities such as access, processing, storing, and managing accounting data using Internet computing infrastructures. According to reference [4], cloud accounting involves the application of cloud computing technologies to accounting processes. The use of cloud accounting allows accountants to work with accounting applications and databases through the use of web browsers and mobile phones without geographical limitations. Unlike traditional accounting systems which require considerable investments in hardware, software installation, and maintenance, cloud accounting uses the Software as a Service (SaaS) approach to provide cost-effective and scalable solutions [6].

Cloud accounting has been found to be very useful in current business environments due to its role in providing opportunities for efficient real-time financial reporting, collaboration between stakeholders, efficient management of accounting information, and data-driven decision-making [5]. Reference [7] argued that the adoption of cloud accounting is an important step towards transforming business operations because of its impact on business agility and efficiency. Recent research works also show that cloud accounting leads to improvement in the quality of financial reporting, reporting transparency, and organizational competitiveness through efficient management of financial information [12].

2.1.2. Cost of Software

The cost of software is the amount of money invested in purchasing and maintaining accounting systems for cloud accounting. Such costs may include subscription costs, customization fees, technical support fees, and upgrade costs [10]. While it is true that initial costs of software purchases can increase costs, they are usually considered long-term investments that are meant to improve the efficiency of operations and performance of an organization. Studies have shown that investments in accounting technologies lead to better performance as a result of improved management of information [15,22].

2.1.3. Cost of Training

Training costs are amounts of money spent by organizations in order to train staff to use cloud accounting technologies. Training cost include expenditure incurred in organizing workshops, seeking certification, obtaining consultancy, paying for technical support, among others [10]. Training is important because success of cloud accounting depends on the ability of employees to use accounting technologies. According to [25], acceptance and usefulness of technologies play a significant role in technology adoption outcomes. Excessive training costs, however, can negatively affect profitability in poorly funded organizations [26].

2.1.5. Return on Assets (ROA)

Return on Assets is a ratio used to determine the efficiency with which a firm generates profits in relation to its total asset. It is calculated as net income over total assets [23]. ROA reveals how effectively an organization's management utilizes its resources to generate income. High ROA represents efficient utilization of assets. With regards to cloud accounting, improvement in management of information, process automation, and decision making will improve ROA.

$$ROA = \frac{Net\ Income}{Total\ Assets} \quad (1)$$

2.1.6. Return on Equity (ROE)

Return on Equity measures the profitability that is obtained from the investments of shareholders' investments in an organization. It is determined by dividing the net income by shareholders' equity [24]. It represents the efficiency with which the management makes use of owners' funds to generate profits. Cloud accounting will help to improve ROE through improved financial management and decision-making processes.

$$ROA = \frac{Net\ Income}{Shareholders'Equity} \quad (2)$$

2.2. Theoretical Review

This paper is anchored on three theories namely Technology Acceptance Model, Resource-Base View and Dynamic Capabilities Theory.

2.2.1. Technology Acceptance Model (TAM)

This paper adopts Technology Acceptance Model (TAM), developed by [25] to gain insights into how new technologies are adopted and used. In this model, an employee's willingness to adopt a new technology depends on two perceptions, one, the perception of its usefulness and two, ease of use. In particular, perceived usefulness means that an employee finds it useful from his/her perspective since he/she thinks that the new technology will improve job performance.

Thus, the link between the TAM framework and cloud accounting stems from the ability of this theory to explain why companies make investment decisions concerning their accounting activities and training of employees. A firm is more inclined to adopt a cloud accounting system if management and employees consider this technology an important tool for accounting practices improvement. Moreover, investments into training programs is essential because adoption and use of the technology will require special skills on behalf of workers. While some criticism exists as to the applicability of this model, it fails to take into account other factors that affect technology adoption. TAM is still one of the mostly used theories of information systems research and provides a suitable theoretical basis for examining cloud accounting investments and organizational performance.

2.2.2. Resource-Based View (RBV) Theory

The Resource-Based View (RBV) theory was introduced by [33] and further developed by [34]. According to the RBV theory, sustainable competitive advantage arises due to a firm's possession of VRIN (valuable, rare, inimitable, and non-substitutable) resources. The theory claims that the success of a company depends more on internal strategic resources rather than external market factors. Strategic resources include tangible resources, technology, organizational capabilities, and human resources, which increase the ability of a company to generate more value and outperform competitors.

In the case of cloud accounting, expenditures on software and training represent strategic organizational resources that could help to increase efficiency in accounting practices, improve the quality of financial reports, and facilitate management decisions. Cloud accounting allows for real-time accounting data processing, automation of routine tasks, improvement of internal control, while training increases employees' skills to use these technologies. Hence, a company's investment in cloud accounting is likely to lead to better financial performance thanks to higher efficiency and better resource utilization. This theoretical background forms the basis of the current research explaining how software costs and training costs may increase ROA and ROE of publicly-traded consumer goods firms in Nigeria.

2.2.3. Dynamic Capabilities Theory

Dynamic Capabilities Theory, developed by [35], illustrates why companies succeed in achieving sustainable competitive advantages in dynamically changing business environments. According to this approach, it is important not only to have valuable resources but also to be able to integrate, reconfigure, and constantly develop them in line with technological and market developments. Dynamic capabilities allow organizations to innovate and effectively use new technologies to achieve higher performance.

This theory is relevant in terms of cloud accounting, as its efficient implementation presupposes constant technological updates, organizational learning, and employee development. Financial investments into cloud accounting programs help organizations to acquire advanced technological infrastructures, whereas training employees allows using these technologies effectively. Organizations that are skilled enough in integrating technological resources with the competence of their employees are expected to achieve better results in terms of accounting and financial reporting. It is more likely for them to be more profitable due to improved efficiency. In terms of this research, Dynamic Capabilities Theory will explain how organizations benefit from constant investments in software and training to become more flexible in the face of digital transformation and to get higher ROA and ROE.

2.3. Empirical Review

Based on the current empirical literature, it is possible to argue that cloud accounting is positively associated with the overall organizational performance of firms. At the same time, the relationship between cloud accounting and organizational performance may vary depending on the characteristics of an industry, geographical location, and methodology of the study.

According to [22], cloud-based accounting systems were positively associated with profitability among Nigerian pharmaceutical firms. In addition, reference [14] found out that cloud accounting positively influenced human capital, structural capital, and relational capital, leading to higher business performance. The study highlighted that cloud accounting facilitated organizational efficiency as well as organizational learning and knowledge management. Likewise, [7] asserted that the use of cloud technologies contributed to digital transformation as it enhanced information accessibility and effectiveness of decisions.

Furthermore, empirical studies have continued emerging in accounting field. For example, based on a recent study carried out by [26], cloud accounting had a significant effect on profitability indicators among the listed manufacturing firms. Moreover, according to [27], cloud accounting positively influenced the activities of manufacturing firms due to information accessibility needed for the strategic decision making. Similar results were presented by [10]. Their research showed that elements such as software costs and training costs positively affected firm performance. The study concludes that cloud accounting constitutes an essential determinant of organizational competitiveness and profitability. The study of [13] found that cloud accounting adoption positively affects financial reporting quality of deposit money banks.

Reference [10] examined listed Nigerian food and beverage companies using software cost, training cost, risk cost, ROE and market value, whereas the present study extends the analysis to the broader consumer goods sector and estimates long-run relationships using Panel FMOLS rather than conventional panel regression. Similarly, [26] investigated manufacturing firms using cloud accounting cost variables but did not account for long-run cointegration. In contrast, the current study first established cointegration before estimating the long-run effects of software and training costs on both ROA and ROE.

More recent studies confirmed the strategic role of cloud accounting in organizations. For example, the study carried out by [28] found that cloud-enabled accounting information systems increased organizational performance due to improvements in information quality and decision-making processes. According to [16], cloud-based accounting systems positively impacted financial reporting quality of Nigerian listed firms. Furthermore, [17] proved that cloud accounting adoption had a significant positive effect on financial performance among the Bangladeshi banking sector. Reference [18] also found out that cloud computing capability positively influenced accounting system effectiveness and financial management of Vietnamese firms.

However, there are some gaps regarding area of interest. First, it is observed that most studies in this area investigate cloud accounting adoption, financial reporting quality, and SME performance but not the specific impact of different aspects of cloud accounting cost on organization performance. Second, most previous empirical investigations in this area were on survey-based methods, while fewer studies applied long-run panel estimation. Thirdly, few researchers paid attention to the Nigerian consumer goods sector which plays a vital role in the country's economy. Hence, this paper aims to examine the long-run effects of software costs and training costs on return on assets and return on equity of selected consumer goods companies in Nigeria using FMOLS estimator.

3. Methodology

This study adopts a quantitative approach to investigate the influence of investments in cloud accounting on performance in selected consumer goods companies in Nigeria using econometric model based on panel data analysis. Secondary data were extracted from the annual reports and accounts of ten (10) selected consumer goods companies listed in Nigeria from the year 2014 to 2023.

The cost of software was extracted from notes to the financial statements, relating to computer software, accounting software subscriptions, enterprise resource planning (ERP) software, cloud-based accounting platforms, software licensing expenses and software maintenance costs directly associated with accounting information systems. Training cost was obtained from staff training, ICT training, accounting systems training and professional development expenditures specifically related to the implementation and operation of accounting information systems. Where annual reports aggregated these expenditures under administrative expenses, the accompanying notes were examined to identify accounting-related software and training expenditures.

The proxies for cloud accounting investment in this study includes cost of software (COS), and cost of training (COT). The proxies for firm performance include return on assets (ROA), and return on equity (ROE). The consumer goods firms selected for this research include Nestlé Nigeria Plc, Dangote Sugar Refinery Plc, Flour Mills of Nigeria Plc, Guinness Nigeria Plc, Honeywell Flour Mills Plc, International Breweries Plc, Unilever Nigeria Plc, PZ Cussons Nigeria Plc, NASCON Allied Industries Plc, and Cadbury Nigeria Plc.

The choice of software cost (COS) and training cost (COT) as proxies for cloud accounting investment follows previous Nigerian empirical studies [10, 26], which operationalised cloud accounting using these expenditure components. More so, ROA and ROE were selected because the former is an indicator of efficiency in earning from total assets by managers, which has been widely used in research concerning accounting technology and organization performance [23,26]; while the latter show the returns received by stockholders as used by, and the indicator has been used in research regarding cloud accounting, as in previous studies [10,22].

Prior to estimation of the econometric model, some preliminary diagnostics were carried out on the log-transformed data in order to guarantee validity of the subsequent analyses. However, ROA and ROE contains negative values, resulting to the application of shifted log transformation where a constant equal to the absolute value of each of the minimum ROA and ROE plus one was added to all observations before applying the natural log-transformation [31,32].

Panel unit root tests such as Augmented Dickey-Fuller Fisher Chi-Square (ADF-Fisher) and Levin, Lin, and Chu (LLC) were conducted on the data to determine the order of integration and stationarity of the variables. As the fully modified ordinary least squares (FMOLS) estimator assumes long-run equilibrium between the variables in the model, panel cointegration tests were conducted using the Pedroni residual cointegration method. This test checks the existence of a stable long-run equilibrium relationship between the dependent variable and the independent variables notwithstanding non-stationarity in individual series.

Since the existence of cointegration was confirmed amongst the variables, the estimation of the long-run relationship between the variables was done using the Panel Fully Modified Ordinary Least Squares (FMOLS) estimator. This is because the use of FMOLS estimators is justified in this case since they provide consistent long-run parameter estimates in the presence of cointegration in panel data through correction for endogeneity and serial correlation using non-parametric correction [36,37]. Therefore, the use of the FMOLS estimator can be considered as a robust way of estimating long-run relationships between cointegrated variables. To test the adequacy of the model, the Jarque-Bera test and the Wald test were used.

The core estimation involves running separate FMOLS regressions for ROA and ROE. For ROA, the model is specified as:

$$\begin{aligned}\ln ROA_{it} &= \alpha_i + \beta_1 \ln COS_{it} + \beta_2 \ln COT_{it} \\ &+\epsilon_{it}, i = 1,2,\ldots,N; t = 1,2,\ldots,T\end{aligned} \tag{3}$$

While for ROE, the model is specified as:

$$\ln ROE_{it} = \alpha_i + \beta_1 \ln COS_{it} + \beta_2 \ln COT_{it} + \epsilon_{it} \tag{4}$$

The coefficients β_1 and β_2 represent the long-run The coefficients β_1 and β_2 represent the long-run elasticities of ROA/ROE with respect to changes in the cost of software and training, respectively..

3.1. Estimation Techniques

3.1.1. Stationarity Test

The unit root test of this paper was tested using the Panel Augmented Dickey-Fuller (ADF-FC) and Levin, Lin, and Chu (LLC) approaches. Taking the ADF-FC into consideration, the underlying regression for each cross-section i is typically written as:

$$\begin{aligned}\Delta y_{it} &= \alpha_i + \rho_i y_{i,t-1} \\ &+\sum_{j=1}^{p_i} \Upsilon_{ij} \Delta y_{i,t-j} + \epsilon_{it}; t = 1,2,\ldots,T\end{aligned} \tag{5}$$

where y_{it} is the variable under investigation, Δ denotes the first difference, α_i represents the individual-specific intercept capturing fixed effects, and Υ_{ij} is the coefficients on the lagged differences to correct for higher-order serial correlation. Under the null hypothesis of a unit root, we have $H_0 : \rho_i = 0$ for each i, while under the alternative, $H_1 : \rho_i < 0$ (indicating stationarity). Estimation of the parameters is typically carried out using OLS for each equation, and then the individual t-statistics are given as:

$$t_{\rho_i} = \frac{\hat{\rho}_i}{SE(\hat{\rho}_i)} \tag{6}$$

In contrast, the Levin, Lin, and Chu (LLC) test assumes homogeneity in the autoregressive coefficient across cross-sections. The LLC regression is given by:

$$\begin{aligned}\Delta y_{it} &= \alpha_i + \rho y_{i,t-1} + \sum_{j=1}^{p_i} \Upsilon_{ij} \Delta y_{i,t-j} \\ &+\epsilon_{it} i = 1,2,\ldots,N; t = 1,2,\ldots,T\end{aligned} \tag{7}$$

where the key difference is that the parameter ρ is common across all (iii) under the alternative hypothesis

The LLC procedure involves first removing individual effects, usually through demeaning or detrending and then pooling the data to estimate the common parameter via OLS. The standardized t-statistic for testing ρ is computed as:

$$t^{*}_{LLC} = \frac{\hat{\rho}}{SE(\hat{\rho})} \tag{8}$$

With adjustments made to account for serial correlation and cross-sectional dependence. Under the null, this statistic is asymptotically standard normal, and its value is compared with the critical values derived in Levin, Lin, and Chu (2002) to determine whether to reject the unit root hypothesis.

3.1.2. Panel Fully Modified OLS Estimation

The baseline panel cointegration model is specified as:

$$\begin{aligned} y_{it} &= \beta_0 + \beta_1 x_{1it} + \beta_2 x_{2it} \\ &+ \epsilon_{it}, i = 1,2,\ldots,N; t = 1,2,\ldots,T \end{aligned} \tag{9}$$

where y_{it} represents the performance indicator (either ROA or ROE) for firm i at time t, x_{1it} denotes the cost of software, x_{2it} denotes the cost of training, α_i captures the individual-specific fixed effects, and ϵ_{it} is the error term. The FMOLS estimator is used to obtain consistent estimates of the long –run coefficients β_1 and β_2 by non-parametrically correcting for endogeneity and serial correlation. The FMOLS estimator can be expressed as:

$$\hat{\beta}^{FMOLS} = \left(\sum_{i=1}^{N} \sum_{t=1}^{T} \tilde{x}_{it} \tilde{x}_{it}^{'} \right)^{-1} \left(\sum_{i=1}^{N} \sum_{t=1}^{T} \tilde{x}_{it} \tilde{y}_{it} \right) \tag{10}$$

where $\tilde{x}_{it}$ and $\tilde{y}_{it}$ denote the variables adjusted for the long-run covariance structure.

To validate the model assumptions, the normality of the residuals ϵ_{it} is often tested using the Jarque-Bera test, which under the null hypothesis assumes that:

$$\epsilon_{it} \sim N\left(0, \sigma^2\right) \tag{11}$$

Finally, the joint significance of β_1 and β_2 is tested using the Wald test. Under the null hypothesis,

$H_0 : \beta_1 = 0$ and $\beta_2 = 0$

The Wald statistic is computed as:

$$W = \left(\hat{\beta} - \beta_0\right)^{'} \left[Var\left(\hat{\beta}\right)\right]^{-1} \left(\hat{\beta} - \beta_0\right) \sim \chi^2_q \tag{12}$$

where $\hat{\beta} = \left(\hat{\beta}_1, \hat{\beta}_2\right)^{'}$, $\beta_0 = (0,0)^{'}$, and $q = 2$ is the number of restrictions in this regard. A significant W statistic (with a low p-value) indicates that the null hypothesis can be rejected, thereby confirming that cloud accounting investments (cost of software and training) significantly influence firm performance.

4. Result and Discussion

4.1. Descriptive Statistics and Correlation Analysis of Study Variables

Table 1 provides the descriptive statistics for the performance measures used. Specifically, the ROA measures have a mean of approximately 4.45% with a median of 4.03%. This implies that the distribution measure appears to be negatively skewed with a coefficient skewness of -0.35. The high kurtosis of value of 5.63 suggests a leptokurtic distribution. In addition, the Jarque-Bera test statistic (p-value < 0.001) suggests significant departure from the normality assumption. On the other hand, the ROE measure has a mean of approximately 19.94% and a significantly lower median of 10.22%. In addition, the distribution of this measure is strongly positively skewed, with a coefficient of skewness of 3.03. Furthermore, the value of kurtosis is 16.95, which again indicates a leptokurtic or heavy-tailed distribution. Thus, based on the significant Jarque-Bera test statistic, it can be inferred that ROE deviates significantly from normality.

Table 1. Descriptive Statistics of cloud accounting variables and performance of listed Goods Companies

Statistic	ROA	ROE	COS	COT
Mean	0.044501	0.199394	1519.600	1541.320
Median	0.040300	0.102200	291.0000	320.5000
Maximum	0.264900	2.930900	21310.00	18795.00
Minimum	-0.300900	-0.930800	0.000000	0.000000
Std. Dev.	0.082852	0.457260	3724.758	3025.029
Skewness	-0.346853	3.029184	3.480498	3.696044
Kurtosis	5.625008	16.94706	15.25906	18.32976
Jarque-Bera	30.71623	963.4350	828.0830	1206.853
Probability	0.000000	0.000000	0.000000	0.000000

Source: Researchers' Self-Computation

As noted above, the cost of software (COS) and cost of training (COT) are also positively skewed. Specifically, COS has a mean of 1519.60 and a median of 291.00. These statistics suggest strong skewness of about 3.48 due to some large number of observations. Similar skewness is obtained from COT, which has a mean of 1541.32 and a median of 320.50 with skewness of 3.70. The values of kurtosis for the two measures are equally high (COS: 15.26, COT: 18.33). The two Jarque-Bera statistics are highly significant (p-values < 0.001).

Table 2. Correlation Analysis

	lnROA	lnROE	lnCOS	lnCOT
ROA	1			
ROE	0.226482	1		
COS	0.206019	0.589064	1	
COT	-0.127601	-0.065183	0.152739	1

Source: Researchers' Self-Computation

The correlation analysis result in Table 2 reveals that lnROA, lnROE, lnCOS, and lnCOT exhibit mostly weak relationships with each other, except for a moderate positive correlation between lnROE and lnCOS (0.589), suggesting that changes in COS could somewhat align with changes in lnROE. ROA shows a weak positive relationship with both lnROE (0.226) and lnCOS (0.206), while it has a weak negative correlation with lnCOT (-0.128), indicating a slight inverse relationship. Overall, ROE and COS have the strongest correlation, while other pairs show minimal interaction, suggesting that the link between ROE and COS may offer the most significant insights within this data..

4.2. Pre-estimation Tests and Model Estimation

Table 3 depicts the panel unit root tests of the study variables. The ADF-FC test results indicate that for all four variables (lnCOS, lnCOT, lnROA, and lnROE), the null hypothesis of a unit root cannot be rejected at levels, with p-values well above conventional significance thresholds. However, once the series is first-differenced, the p-values drop significantly (ranging from 0.0004 to 0.0395), indicating that the null of non-stationarity is rejected after differencing. This shift implies that each variable becomes stationary once first differenced, providing initial evidence that the underlying series are integrated of order one, I(1).

Table 3. Panel Unit Root Test

Variable	ADF-FC		Levin, Lin and Chu t*		I(.)
	Test @ level	Test @1st Diff.	Test @ Level	Test @1st Diff.	
lnCOS	27.447 [0.123]	33.273 [0.032]	2.5979 [0.005]	-4.3878 [0.000]	I(1)
lnCOT	16.490 [0.686]	47.886 [0.000]	-0.336 [0.369]	-8.2116 [0.0000]	I(1)
lnROA	23.7013 [0.2557]	38.149 [0.009]	-2.0424 [0.021]	-6.4657 [0.000]	I(1)
lnROE	22.975 [0.290]	32.369 [0.040]	-1.3293 [0.092]	-2.9123 [0.002]	I(1)

Figures in [ ] represents p-values
Source: Researchers' Self-Computation

Complementing the ADF-FC results, the Levin, Lin and Chu (LLC) t* test shows a similar pattern. At levels, the LLC statistics for lnCOT and lnROE are not significantly different from zero (with p-values of 0.3686 and 0.0919, respectively), and while lnCOS and lnROA show some indication of stationarity at level (p = 0.0047 and p = 0.0206), this is not uniformly strong across all variables. Once first-differenced, however, the LLC test delivers robust evidence against the presence of a unit root, with highly significant statistics (p-values of 0.0000 for lnCOS, lnCOT, lnROA, and 0.0018 for lnROE), thereby reinforcing the conclusion that these series are I(1).

As a result of the I(1) series, testing for panel co-integration is inevitable, i.e. to test for whether the variables share a common long-run equilibrium relationship despite being individually non-stationary.

The Pedroni cointegration tests for both models in Table 4 provide mixed evidence when comparing the unweighted and weighted statistics under the within-dimension tests. For the ROA equation, while the unweighted Panel v-statistic is significant (*p* = 0.0059), its weighted counterpart is not (*p* = 0.6758). However, the weighted Panel PP-statistic (-2.77547, *p* = 0.0028) and Panel ADF statistic (-2.956101, *p* = 0.0016) strongly reject the null hypothesis of no cointegration, even though the corresponding unweighted statistics are not consistently significant. Therefore, after taking into consideration heterogeneity and serial correlation by adjusting weights on the variables, there is sufficient proof of long-run relationship between ROA and the independent variables COS and COT. Similarly, for the ROE model, there is also an indication that when there are no adjustments for heterogeneity and serial correlation, the results indicate rejection of the null hypothesis of cointegration while in the case where adjustment for heterogeneity and serial correlation are considered, the result does not show any significant evidence of cointegration between ROE and its determinants. However, the Weighted Panel PP-statistic (-2.93361, p = 0.0017) and Weighted Panel ADF-statistic (-2.42621, p = 0.0076) clearly reject the hypothesis of no cointegration.

Table 4. Pedroni Cointegration Tests

	lnROA = f(lnCOS, lnCOT)		lnROE = f(lnCOS, lnCOT)	
Within Dimensions	Unweighted Statistic	Weighted Statistic	Unweighted Statistic	Weighted Statistic
Panel v-Statistic	2.519111 [0.0059]	-0.45596 [0.6758]	8.782867 [0.0000]	1.014957 [0.1551]
Panel rho-Statistic	-0.109113 [0.4566]	0.79311 [0.7861]	0.302128 [0.6187]	0.09693 [0.5386]
Panel PP-Statistic	-1.332954 [0.0913]	-2.77547 [0.0028]	2.58176 [0.9951]	-2.93361 [0.0017]
Panel ADF-Statistic	-0.311666 [0.3776]	-2.956101 [0.0016]	2.666650 [0.9962]	-2.42621 [0.0076]
Between-dimensions	Statistic	p-value	Statistic	p-value
Group rho-Statistic	1.967262	0.9754	1.572611	0.9421
Group PP-Statistic	-4.887952	0.0000	-3.406080	0.0003
Group ADF-Statistic	-2.747357	0.0030	-1.947976	0.0257

Figures in [ ] represents p-values
Source: Researchers' Self-Computation

Taking the between-dimensions tests into consideration, both equations have indications of cointegration between their independent and dependent variables. While the Group rho-statistics in both equations do not reject the null hypothesis of no cointegration, Group PP-statistics for ROA equation (-4.887952, p = 0.0000) and Group ADF-statistics for ROA equation (-2.747357, p = 0.0030) clearly reject it. Similarly, in the ROE equation, Group PP-statistics (-3.406080, p = 0.0003) and Group ADF statistics (-1.947976, p = 0.0257) also show strong evidence against the null. Therefore, despite some inconsistency of the un-weighted statistics, the results of weighted and between-dimensions tests clearly suggest cointegration among performance indicators and cost drivers of cloud accounting. Therefore, these models can be subjected to long-run estimations like fully modified OLS.

From the results shown in Table 5 using the FMOLS estimations, it is clear that there exist different influences from the two cost components towards the performance measures of selected consumer goods firms operating in Nigeria. According to the ROA specification, the influence of the training cost component on ROA is indicated through the coefficient value of lnCOT, which is equal to -0.021263 (t = -2.37, p = 0.0200<0.05). This implies that a 1% increase in the cost of training is associated with a decrease of ROA by 0.021%, indicating a negative relationship between training costs and asset performance. However, the coefficient value for lnCOS in the lnROA regression is 0.000731 (t = 0.096, p = 0.9236), implying that software costs are not statistically significant in influencing the return on asset measure.

Table 5. Panel FMOLS Estimates

	Dependent = lnROA		**Dependent = lnROE**	
Variables	**Coefficient [SE]**	**t-Statistic {p-value}**	**Coefficient [SE]**	**t-Statistic {p-value}**
lnCOT	-0.021263 [0.00896]	-2.374497 {0.0200}	-0.083788 [0.047068]	-1.780171 {0.0795}
lnCOS	0.000731 [0.00760]	0.096154 {0.9236}	0.118809 [0.037066]	3.205314 {0.0021}
R-squared	0.387886		0.661720	
Adjusted R-squared	0.301563		0.557251	
S.E. of regression	0.070242		0.319036	
Long-run variance	0.004389		0.064626	
Companies	**Deterministic Coefficients**	**@Trend**	**Deterministic Coefficients**	**@Trend**
Nestle	1.1506	-0.0084	-0.0981	0.12991
Dangote Sugar	0.5337	-0.0076	0.3346	-0.06540
Flour Mills	0.6919	0.0369	-0.0403	0.01173
Guinness Nigeria	0.7022	0.0041	0.1643	-0.04937
Honeywell	0.6362	0.0013	0.0789	-0.01150
International Breweries	0.4199	0.0499	0.1724	-0.09996
Unilever	0.6740	0.0078	-0.2095	0.00376
PZ Cussons	0.8885	-0.0046	-0.1270	0.01773
NASCON Allied Industries PLC	0.5957	-0.0009	-0.0009	0.02857
Cadbury Nigeria	0.7843	-0.0443	-1.0001	0.25109

Source: Researchers' Self-Computation

According to the ROE specification, training costs are negatively associated with equity returns, but only with a marginal level of statistical significance (p=0.0795<0.10) where the negative coefficient of -0.083788 (t=-1.78) is used to measure training costs. However, the coefficient value for LNCOS, which represents the software costs, is 0.118809 (t=3.205, p=0.0021) and thus positively and statistically significant in influencing the ROE value. It means that a 1% increase in software costs is associated with approximately a 0.119% increase in transformed ROE, which demonstrates the positive influence of software costs on equity performance.

Firm-specific deterministic are used to measure the firm intercept and trend in the regression analysis models. They represent the firm-specific intercept and trend of each firm being analysed within the two specified performance measures. For instance, according to the ROA model, the deterministic and trend component for the Nestlé firm and the Dangote Sugar firm are 1.1506(-0.0084) and 0.5337 (-0.0076), respectively. These firm-specific values account for heterogeneity that is not explained by the cost variables, reflecting differences in baseline performance levels and long-run trends among the companies.

Overall, the result shows that although the investment in cloud accounting software enhances firm profitability, measured using ROE, training costs are likely to influence firm performance. Training costs tend to impair firm performance since they are significantly associated with asset performance. On the other hand, software costs are likely to contribute positively towards firm performance as measured using ROE, due to the 66.17% variation explained.

4.3. Post estimation tests

Table 6. JarqueBeraNormality of Residual Test

Models	Test Statistic	p-value
$ROA_{it} = f(COS_{it}, COT_{it})$	1.09490	0.5784
$ROE_{it} = f(COS_{it}, COT_{it})$	2.64733	0.6350

Source: Researchers' Self-Computation

In Table 6, the normality test results for the residuals of both models indicate same distributional properties. For both model, the test statistic are 1.09490 and 2.64733 with p-values of 0.5784 and 0.6350 respectively, which are well above the conventional significance level of 0.05. This implies that we fail to reject the null hypothesis of normality, implying that the residuals from the performance models are approximantely normally distributed, thereby withholding the assumptions of classical linear regression model.

Table 7 presents Wald test results for assessing the stability of the panel FMOLS models, where the null hypothesis is that the normalized restrictions on the coefficients (C(1) and C(2)) are equal to zero. In the ROA model, the F-statistic of 4.1586 (with corresponding chi-square of 10.317) and the normalized restrictions (C(1) = –0.5572, SE = 0.0035; C(2) = 0.3587, SE = 0.0024) strongly reject the null, indicating that both cost variables significantly influence ROA. Similarly, the ROE model exhibits an F-statistic of 5.6841 (p = 0.0052) and a chi-square statistic of 11.3682 (p = 0.0034), with normalized restrictions (C(1) = –0.0838, SE = 0.0471; C(2) = 0.1188, SE = 0.0371) that are also significantly different from zero.

Table 7. Wald Test for Model Stability

Models	Test Stat.	Value	df	p-value	NR (=0)	Value	SE
$\ln ROA_{it} = f(\ln COS_{it}, \ln COT_{it})$	F	4.1586	(2, 68)	0.0048	C(1)	-0.5572	0.0035
	$\chi2$	10.317	2	0.0012	C(2)	0.3587	0.0024
$\ln ROE_{it} = f(\ln COS_{it}, \ln COT_{it})$	F	5.6841	(2, 68)	0.0052	C(1)	-0.0838	0.0471
	$\chi2$	11.3682	2	0.0034	C(2)	0.1188	0.0371

NR represents Normalised Restrictions
Source: Researchers' Self-Computation

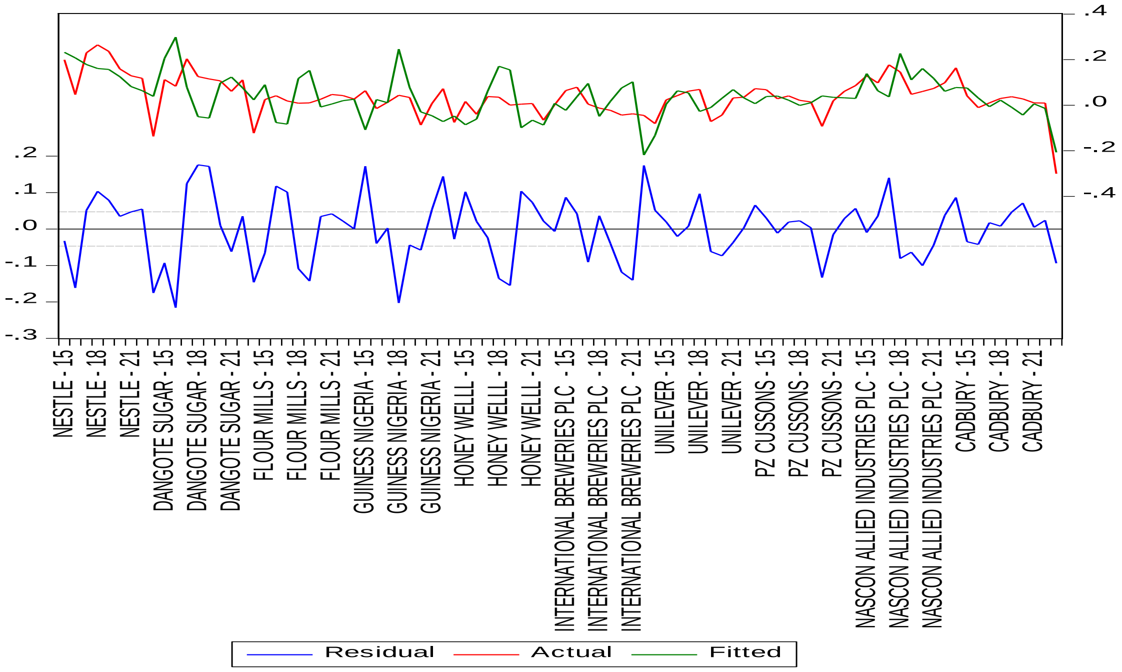

Figure 1. Plot of residual, actual and fitted values of Consumer Goods Performance using ROA

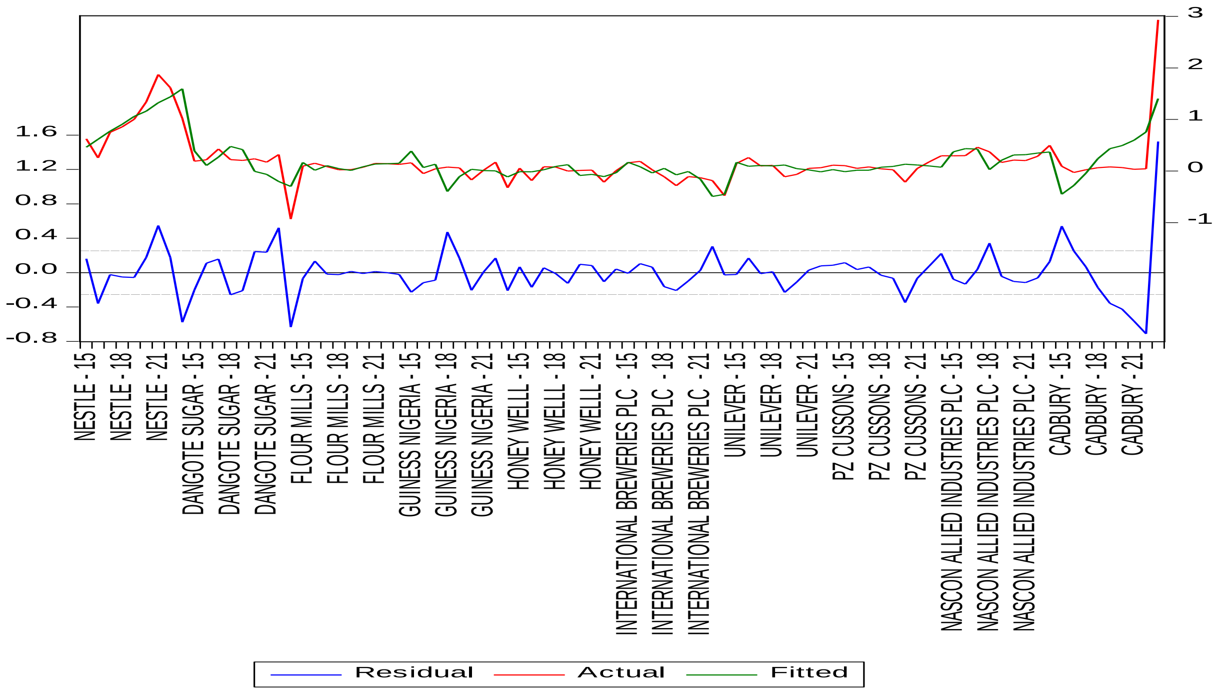

Figure 2. Plot of residual, actual and fitted values of Consumer Goods Performance using ROE

Figure 1 and Figure 2 showing the plot of residual, actual and fitted values of ROA and ROE respectively indicated the capturing of goodness of fit as the actual and fitted lines do not significantly deviate from each other. Overall, these results confirm that the long-run coefficients for both models are statistically significant, thereby validating the stability and robustness of the imposed restrictions in explaining the long-run relationships between cloud accounting costs and the performance of Nigerian consumer goods companies.

4.4. Discussion of Findings

The study's findings highlight the dual impact of cloud accounting investments on firm performance in the Nigerian consumer goods sector. The FMOLS estimation results showed that while the cost of software (lnCOS) has a significant positive effect on return on equity (lnROE), its impact on return on assets (lnROA) is not statistically significant. This means that the investments in cloud-based accounting software actually do lead to an improvement in firms' financial performance, but not necessarily in asset efficiency. The cost of training (lnCOT), on the other hand, has a comparatively large negative effect on ROA and a slightly negative effect on ROE, indicating that the short-term costs of training workers on cloud accounting systems may be larger than the benefits. The negative coefficient may also reflect the initial implementation and adjustment costs associated with employee training. These costs are incurred immediately, whereas productivity gains from improved staff competencies may only materialise over a longer period.

The results showed that training costs with cloud accounting technology must be strategically managed to get the maximum benefits in the firm's performance.

The results are consistent with previous studies highlighting the positive impact of cloud accounting on financial efficiency and reporting. However, [10]discovered that the cost of cloud accounting has a significant impact on the financial performance of publicly listed manufacturing companies in Nigeria, with positive impact on ROE, similar to the results obtained in this particular study. In the same way, [26] found that the adoption of cloud accounting can have a positive impact on the profitability of the firm, thus supporting the idea that investment in software adds value to the firm. The negative impact of training found in this study, however, is in agreement with that of reference [12] who observed that although cloud accounting has the potential to enhance financial information quality, the training costs can be a challenge for companies, particularly in developing economies.

Also, these findings support those of [13,29,30], which suggested that the use of cloud accounting improves financial reporting quality and performance among sampled firms in the banking industry. This study however concentrates on the consumer goods industry and examines the possibility that industry specific factors can affect the value of cloud accounting investments. The finding of a long run relationship is also consistent with the finding from the Pedroni cointegration test that cloud-based accounting investments increase the components of intellectual capital which subsequently leads to increases in the firm's performance, as confirmed by [14].

Overall, this paper is consistent with the literature that has documented the benefits of cloud accounting on firm performance, in particular, equity returns. It does also add a word of warning, however, by acknowledging the cost of training, particularly the financial impact, which can influence short-term profitability of business firms. Based on these findings, it can be concluded that businesses should take a balanced approach to investing in software and optimising training spending to maximise the performance benefits they can achieve.

5. Conclusion and Recommendations

The findings from the Panel FMOLS estimation indicate that the relationship between cloud accounting investments and firm performance is mixed. Software cost exhibits a positive and statistically significant association with Return on Equity (ROE), suggesting that investment in cloud accounting software may improve shareholders' returns over the long run. In contrast, training cost is negatively associated with Return on Assets (ROA), indicating that the financial benefits of training may not be realised immediately and may involve short-term costs. The Pedroni cointegration and Wald test results further provide evidence of a stable long-run equilibrium relationship between cloud accounting cost components and firm performance.

It should be pointed out that this study is aimed at examining the connection between cloud accounting investments and financial performance of firms while not including the control variables for factors such as size, leverage, liquidity, and sales growth which affect performance of businesses. Thus, it is important to interpret the findings with regard to the study's methodological approach.

From the findings perspective, consumer goods companies should carefully evaluate investments in cloud accounting software and implement employee training programmes efficiently to maximise long-term benefits while minimising unnecessary implementation costs. It is necessary for managers to continually evaluate software investments and training expenses to maximise the benefits from them. Considering the methodology used in this study, it is crucial to approach policy implications cautiously. Future studies should explore the relationship by using firm-specific and macroeconomic control variables along with alternative panel estimators and expanding the analysis to other business sectors in Nigeria.

References

[1] Devaraj, S. M. “Cloud, Ai, and digital transformation: a winning combination”. *International Journal of Computer Engineering and Technology*, *15*(5), 1020-1032. 2024.

[2] Hatamlah, H., Allan, M., Abu-AlSondos, I., Shehadeh, M. and Allahham, M. “The role of artificial intelligence in supply chain analytics during the pandemic”. *Uncertain Supply Chain Management*, 11(3), 1175-1186. 2023.

[3] Gonçalves, C. A., Messias, C. O. D. S., Soares, J. L., and Peixoto, M. M. D. C. L.. “Adoption of Cloud Computing in the organizations: a bibliometric analysis of this technology within a digital transformation context”. *Revista de Administração da UFSM*, *16*(3). 2023.

[4] Dimitriu, O., and Matei, M. “Cloud accounting: A new business model in a challenging context.” Procedia Economics and Finance, 32, 665–671. 2015.

[5] Asiaei, A., and Ab. Rahim, N. Z. “A multifaceted framework for adoption of cloud computing in Malaysian SMEs”. *Journal of Science and Technology Policy Management*, *10*(3), 708-750. 2019

[6] Chai, W. and Bigelow, S. “Definition of cloud computing”. *Journal of Business and Economic Policy*, 7(3), 32-41. 2021.

[7] Ferri, L., Spanò, R., Maffei, M., and Fiondella, C. Cloud accounting and digital transformation: Implications for business performance. Management Control, 1, 55–76. 2020

[8] Suarta, I. M., Suwintana, I. K. and Sudiadnyani, I. G. (2022). Technology and information system expertise demand for accounting professionals: a requirements analysis of Job advertisements”. *In International Conference on Applied Science and Technology on Social Science*, 7(2), 276-282

[9] Turner, L., Weickgenannt, A. B., and Copeland, M. K. *Accounting information systems: controls and processes*. John Wiley and Sons. 2020.

[10] Onifade, H. O., Shittu, S. A., Aminu, A. O., and Ajibola, K. T. Effect of cloud accounting characteristics on performance of listed food and beverages companies in Nigeria. *Journal of Perspectives in Management*, *7*, 1-10. 2023.

[11] Ahmed, S. S., Guozhu, J., Mubarik, S., Khan, M., and Khan, E. “Intellectual capital and business performance: the role of dimensions of absorptive capacity”. *Journal of Intellectual Capital*, *21*(1), 23-39. 2020.

[12] Akpan, D. C., Ubokudom, A. I., Udiong, N. J., and Akpanowo, R. E. “Cloud Accounting and Financial Reporting Quality of Selected Deposit Money Banks in Nigeria”. *Journal of Accounting and Financial Management*, *9*(9). 2023.

[13] Owolabi, S., Oyegoke, K. and Olalere, M. “Cloud accounting and financial reporting quality of deposit money banks (DMBS) in Nigeria”. *International Journal of Management Studies and Social Science Research*, 5(4), 98-110. 2023.

[14] Kariyawasam, A. H. N. “Analysing the impact of cloud-based accounting on business performance of SMEs”. *The Business and Management Review*, *10*(4), 37-44. 2019.

[15] Gaurav, A., and Ambar, M. T. “The Impact of Cloud-Based Accounting on Financial Reporting Efficiency: A Comparative Study”. *International Journal of Research and Technology*, *13*(2), 18-27. 2025.

[16] Oyewobi, I. A., and Adeyemi, O. L. “Cloud-based accounting information systems and financial reporting quality of listed information and communication technology firms in Nigeria”. Journal of Economics, Finance and Management Studies, 7(4), 2089–2104. 2024.

[17] Ahmed, M., Saha, T., Hossain, T., Hoque, E., and Miah, M. R. “Adoption of cloud accounting and its impact on financial performance: A study on the banking industry of Bangladesh”. Global Business Review.

[18] Nguyen Phu, G., Hoang Thi, T., and Tran Nguyen Bich, H. “The impact of cloud computing technology on cloud accounting adoption and financial management of businesses”. Humanities and Social Sciences Communications, 12, 851. 2025.

[19] Andayani, W., Adib, N., Arif, M. E., Indrayani, Wahyuni, S., Murdianingrum, S. L., and Widiastutik, R. “The adoption of cloud accounting in Indonesian Small and Medium Enterprises (SMEs): exploring drivers, challenges and implications for performance”. *Cogent Business and Management*, *13*(1), 2603023. 2026.

[20] Inayah, A., and Susliyanti, E. D. (2025). The impact of cloud-based accounting systems on SME financial performance in the digital era. *Atestasi: Jurnal Ilmiah Akuntansi*, *8*(2), 138-145.

[21] Saad, M., Lutfi, A., Almaiah, M. A., Alshira’h, A. F., Alshirah, M. H., Alqudah, H., ... and Abdelmaksoud, O. “Assessing the intention to adopt cloud accounting during COVID-19”. *Electronics*, *11*(24), 4092. 2022.

[22] Ikwuo, A. K., Ukoha, A. C., and Nworie, G. O. “Cloud accounting: strategic advantage for maximising Shareholder wealth in Nigeria’s pharmaceutical sector”. *Journal of Governance and Accountability Studies*, *5*(1), 1-16. 2025.

[23] Brigham, E. F., and Ehrhardt, M. C. Financial management: Theory and practice (17th ed.). Cengage Learning. (2022.

[24] Parrino, R., Bates, T. W., Gillan, S. L., and Kidwell, D. S. *Fundamentals of corporate finance*. John Wiley and Sons. 2025.

[25] Davis, F. D. “Perceived usefulness, perceived ease of use, and user acceptance of information technology”. MIS Quarterly, 13(3), 319–340. 1989.

[26] Wisdom, O., and Grace, O. “Cloud accounting cost and financial performance of manufacturing firms in Nigeria”. *Russian Law Journal*, *11*(3), 3060-3068. 2023.

[27] Okere, W. “Cloud accounting and performance of listed manufacturing firms in Nigeria”. *Anadolu İktisat ve İşletme Dergisi*, *6*(2), 124-141. 2022.

[28] Thompson, L. “Cloud-Based Management Information Systems: A Paradigm Shift in Enterprise Resource Planning”. *OTS Canadian Journal*, *4*(6), 62-73. 2025.

[29] Akpan, M. *Cloud Computing: Transforming Accounting in the Digital Age*. In Future-Proof Accounting. 2024. 23-29. Emerald Publishing Limited.

[30] Al-Okaily, M., Alkhwaldi, A. F., Abdulmuhsin, A. A., Alqudah, H., and Al-Okaily, A. “Cloud-based accounting information systems usage and its impact on Jordanian SMEs’ performance: the post-COVID-19 perspective”. *Journal of Financial Reporting and Accounting*, *21*(1), 126-155. 202

[31] Benatia D, Bellégo C, Pape L. Dealing with logs and zeros in regression models. arXiv preprint arXiv:2203.11820. 2022 Mar 22.

[32] Tabachnick BG, Fidell LS, Ullman JB. Using multivariate statistics. Boston, MA: pearson; 2007 Mar 3.

[33] Wernerfelt, B., "A resource-based view of the firm," *Strategic Management Journal*, vol. 5(2), 71–180, 1984.

[34] Barney, J., "Firm resources and sustained competitive advantage," *Journal of Management*, 17(1), pp. 99–120, 1991.

[35] Teece, D. J., Pisano, G., and Shuen, A., "Dynamic capabilities and strategic management," *Strategic Management Journal*, 18(7), 509–533, 1997.

[36] Phillips, P. C., B. and Hansen, B. E., "Statistical inference in instrumental variables regression with I(1) processes," *The Review of Economic Studies*, 57(1), 99–125, 1990.

[37] Pedroni, P., "Panel cointegration: Asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis," *Econometric Theory*, 20(3), 597–625, 2004.