AUDIT INNOVATIVE TECHNOLOGIES AND QUALITY OF AUDIT SERVICES IN NIGERIA

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Abstract

Purpose – Firms' financial reports have lost their credibility as a result of audit failure due to quality audit services and output, the integrity, usefulness, and merit value of financial statement are all under risk. The thrust of this study therefore was to examine the impact of audit innovative technologies on audit quality. **Design/Methodology/Approach** - The study employed the survey research design. The population of the study consisted 3,650 staffs from the big 4 audit firms in Nigeria by their Human Resources department as of June, 2022 via the web page. The sample size consisted of 281 auditors from the big 4 audit firms. Data were sourced through structure questionnaire via Google forms, the data collected was thereafter analyzed using Descriptive and Inferential statistics. **Findings** - The findings revealed that audit innovative technologies have a significant effect on audit timing, audit engagement, audit cost, audit output and processes. **Conclusion** - The study concluded that audit innovative technologies (Cloud and cognitive technologies, data mining, big data analytics, robotics intervention and computer assisted audit tools) have a significant joint influence on audit quality. The study recommended that management should ensure that audit innovative technologies adopted to ensure that work is completed properly within the specified time, thereby facilitating coordination of audit work done by auditors and experts.

Keywords: Cloud and cognitive technologies, Data mining, Audit cost, Audit innovative technologies and Audit quality.

Introduction

Audit quality is critical to financing and investing value chain of corporate structure, it's a vital enabler of vibrant capital market as business evolved. Audit failure occurred when management makes material misrepresentations in their financial statements and auditors fail to catch these errors before the financial statement is made public. (Kend & Nguyen, 2020). This concept has gained increasing popularity and has become a major global issue in the investing community and corporate gatherings. Auditing by design should provide the needed credence on the financial statement, audited financial statements must be of high quality in order for investors and creditors among other stakeholders achieve desired comfort to enable them make an informed decisions on the basis of the financial reports. From the historical perspective and recent happenings across the globe relating to quality of audit outputs, left much to be desired.

The very nature of company's structure necessitated the shareholders and creditor to relied on external validation to eliminate or at best reduce asymmetrical information, audit services was to provide peace of mind and comfort to critical stakeholders who do not have access to source information but have to rely on the information provided by the company's' directors which in most cases do not represent the reality. Audit services theoretically is to bridge this gap and mediate the friction between the agent and the principal, the paradox however is that the mediating role of audit has not lived up to expectation and called to question in the face of numerous corporate failures attributable to audit failure.

Financial reporting quality cannot be separated from audit quality. A large number of accounting scandals of the previous decade have involved explicit manipulation of accounting data, such as registering bogus inventories and disguising liabilities (discretionary accruals), even in the face of audited financial statements. The audit committee has not been able to prevent or reduce the manipulation of financial statements, such as the case of Enron in 2001, Worldcom in 2002, and Royal A-hold in 2003, American Insurance in 2005, Transmile in 2007, Lehman Brothers in 2008, and Toshiba in 2015.

Audit failure has ripple effect on the macro economy, individual entity output accumulate the macro production (GDP), employment, government revenue via tax payment, social impact among other factors. As a result of these and other scandals, investors now have less faith in financial statements, which has a knock-on effect on their decisions to invest and, in turn, on their ability to earn money for the government and other stakeholders as well as for the overall economy (Zhang, 2019).

Business operations are changing and transaction are mostly automated therefore traditional approach to audit no longer holds, the uses of modern technology, devices and tools are to smoothen audit functions, process, cost and time through data vitalization, Data mining, security, robotic audit process automation. The rapid development of new sophisticated technologies in the tech space provides the auditor the ability to gather and analysis more data in an effective and efficient manner as they are likely to be a powerful driver and improve audit quality. Therefore, the thrust of this study is to investigate the impact of audit innovative technologies on

audit timing, audit engagement, audit outcomes, audit cost and audit process.

Literature

Lee, James and Susan (2015) found that IT innovation may make a significant contribution to the accounting industry. Wadesango and Nyakuera (2020) highlighted the impact of computer-assisted techniques and technologies on auditors' work processes. Audit duties can be automated with CAATTs and analyzed electronically by auditors. However, Alves and Martins (2021) found that auditors' fees skyrocketed in direct proportion to the amount of money invested in innovation activities and capitalized R&D.

Le, Tran, and Vo (2021). Furthermore, identified that the e-Audit System Implementation was more successful when the auditors were competent in using information technology, according to Lavinia (2020); Dagiliene and Kloveine (2019) found that application, deployment and implementation of Sophisticated ICT tools, devices and technology effectively improve quality of audit delivery. New audit standards are needed to ensure that auditors can use this technology and improve their audit methods, according to the findings of Najoua and Manita (2021).

Wang (2020) revealed that auditors' fees grow considerably in proportion to the amount of money invested in innovation activities and capitalized R&D in the study link between firm innovation activities and audit fees. A study by Elommal, Patricia, and Lubica

(2019) found that digital technology has a significant influence on audit businesses. There is a strong emphasis in Krieger, Drews and Velte (2021) on the relevance of technology skills in audit companies for the implementation of sophisticated data analytics.

Methodology

The survey research design was applied in this study. This design was considered the most appropriate because it allowed for the solicitation of well-informed views on the impact of audit innovative technologies on audit quality of accounting firms in Nigeria, resulting in detailed thoughts based studies. The use of survey methodology allows for a wide range of questions to be asked about a topic. The population consisted of the auditors in the big 4 audit firms. KPMG, PricewaterhouseCoopers, Deloitte and Ernst and Young with total population size of 3,650 this was summed up from the firms' web pages out of which a sample size of 281 respondents was randomly selected from the big 4 audit firms using Taro Yamane's sample size method. Data was collected using a structured questionnaire via the Google form. The data collected was thereafter analyzed using Descriptive and Inferential statistics.

Empirical Result and interpretation

H_01: There is no significant impact of audit innovative technologies and time spent on audit engagement

Table 1: Results of Regression Estimate Test of Hypothesis One

Variables	Coefficient	St. Error	T-stat	Prob
(Constant)	2.551	1.075	2.374	.018

CCT	.101	.067	1.513	.132
DAM	.154	.065	2.359	.019
BDA	.259	.070	3.703	.000
RIN	.191	.070	2.739	.007
CAAT	.153	.056	2.726	.007
Adjusted R^2	0.452			
F stats	42.109 (0.00)			

Dependent Variable: ATG
Source: Researcher's Field Survey Results (2022)

ATG = f (CCT, DAM, BDA, RIN, CAAT)
$ATG_i = α_0 + β_1CCTi + β_2DAMi + β_3BDA\ i + β_4RINi + β_5CAATi + μi$
$ATG_i = 2.551i + 0.101CCTi + 0.154DAM\ i + 0.259BDAi + 0.191RINi + 0.153CAATi + μi$

The result of the regression analysis for audit innovative technologies on Table 1 shows that the constant 2.551 shows a positive beta coefficient. The coefficient of the independent variable Audit innovative technologies proxies CCT, DAM, BDA, RIN, and CAAT is positive. This is indicated by the sign of the coefficients, that is β1 = 0.101>0, β2 = 0.154>0, β3 = 0.259>0, β4 = 0.191>0 and β5 = 0.153>0. That is, an increase in cloud and cognitive technologies by 1% would cause a 0.101 increase in Audit timing, an increase in data mining by 1% would cause a 0.154 increase in Audit timing, an increase in big data analytics by 1% would cause a 0.259 increase in Audit timing, an increase in robotics intervention by 1% would cause a 0.191 increase in Audit timing and an increase in computer aided auditing tools by 1% would cause a 0.153 increase in Audit timing. This result is consistent with a priori expectation as it was expected that CCT, DAM, BDA, RIN, and CAAT will have positive effects on ATG.

The coefficient of determination of Adjusted R squared which is the explanatory power of the model is 0.452. This implies that within the model context, the independence of audit innovative technologies is responsible for 45% variations in audit timing while the remaining 55% is explained by other factors that can impact on the dependent variable outside the model. Hence, the coefficient of determination shows that the main model has a moderate explanatory power. This further emphasized by the probability of the t-statistics indicating that this model is statistically significant.

The F-statistics at a level of significance of 0.05 is 42.109, with a p-value of 0.0000, which is less than the 0.05 level of significance used in this analysis. The null hypothesis that Audits innovative technologies does not have significant effect on audit timing of accounting firms in Nigeria was rejected. Therefore, from the regression estimates, Audit innovative technologies (cloud and cognitive technologies, data mining, big data analytics, robotics intervention, computer aided auditing tools)

have a significant effect on audit timing of accounting firms in Nigeria.

H$_0$2: There is no significant impact of audit innovative technologies on audit engagements.

Table 2: Results of Regression Estimate Test of hypothesis Two

Variables	Coefficient	St. Error	T-stat	Prob
(Constant)	2.466	1.036	2.381	.018
CCT	.097	.065	1.505	.133
DAM	.082	.063	1.294	.197
BDA	.130	.067	1.930	.055
RIN	.349	.067	5.190	.000
CAAT	.200	.054	3.697	.000
Adjusted R^2	0.483			
F stats	47.576 (0.00)			

Dependent Variable: AET
Source: Researcher's Field Survey Results (2022)

Model 2
AET = f (CCT, DAM, BDA, RIN, CAAT)
$AET_i = α_0i + β_1CCTi + β_2DAMi + β_3BDAi + β_4RINi + β_5CAATi + μi$
$AET_i = 2.466i + 0.097CCTi + 0.082DAMi + 0.130BDAi + 0.349RINi + 0.200CAATi + μ_i$

The result of the regression analysis for audit innovative technologies on Table 2 shows that the constant 2.466 shows a positive beta coefficient. The coefficient of the independent variable Audit innovative technologies proxies CCT, DAM, BDA, RIN, and CAAT is positive. This is indicated by the sign of the coefficients, that is $β1 = 0.097>0$, $β2 = 0.082>0$, $β3 = 0.130>0$, $β4 = 0.349>0$ and $β5 = 0.200>0$. That is, an increase in cloud and cognitive technologies by 1% would cause a 0.097 increase in Audit engagement, an increase in data mining by 1% would cause a 0.082 increase in Audit engagement, an increase in big data analytics by 1% would cause a 0.130 increase in Audit engagement,

an increase in robotics intervention by 1% would cause a 0.349 increase in Audit engagement and an increase in computer aided auditing tools by 1% would cause a 0.200 increase in Audit engagement. This result is consistent with a priori expectation as it was expected that CCT, DAM, BDA, RIN, and CAAT will have positive effects on AET.

The coefficient of determination of Adjusted R squared which is the explanatory power of the model is 0.483. This implies that within the model context, the independence of audit innovative technologies is responsible for 52% variations in audit engagement while the remaining 48% is explained by other factors that can impact on

the dependent variable outside the model. Hence, the coefficient of determination shows that the main model has a strong explanatory power. This further emphasized by the probability of the t-statistics indicating that this model is statistically significant.

The F-statistics at a level of significance of 0.05 is 47.576, with a p-value of 0.0000, which is less than the 0.05 level of significance used in this analysis. The null hypothesis that Audits innovative technologies does not have significant effect on audit engagement of accounting firms in Nigeria was rejected. Therefore, from the regression estimates, Audit innovative technologies (cloud and cognitive technologies, data mining, big data analytics, robotics intervention, computer aided auditing tools) have a significant effect on audit engagement of accounting firms in Nigeria.

H$_0$3: Audit innovative technologies exert no significant impact on audit outcomes.

Table 3: Results of Regression Estimate Test of hypothesis Three

Variables	Coefficient	St. Error	T-stat	Prob
(Constant)	2.119	1.014	2.090	.038
CCT	.262	.063	4.148	.000
DAM	.087	.062	1.412	.159
BDA	.158	.066	2.389	.018
RIN	.210	.066	3.184	.002
CAAT	.160	.053	3.029	.003
Adjusted R^2	0.491			
F stats	49.085 (0.000)			

Dependent Variable: AOE
Source: Researcher's Field Survey Results (2022)

Model 3
AOE = f (CCT, DAM, BDA, RIN, CAAT)
$AOE_i = \alpha_{0i} + \beta_1 CCT_i + \beta_2 DAM_i + \beta_3 BDA_i + \beta_4 RIN_i + \beta_5 CAAT_i + \mu_i$
$AOE_i = 2.119i + 0.262CCTi + 0.087DAMi + 0.158BDAi + 0.210RINi + 0.160CAATi + \mu i$

The result of the regression analysis for audit innovative technologies on Table 3 shows that the constant 2.119 shows a positive beta coefficient. The coefficient of the independent variable Audit innovative technologies proxies CCT, DAM, BDA, RIN, and CAAT is positive. This is indicated by the sign of the coefficients, that is β1 = 0.262>0, β2 = 0.087>0, β3 = 0.158>0, β4 = 0.210>0 and β5 = 0.160>0. That is, an increase in cloud and

cognitive technologies by 1% would cause a 0.262 increase in Audit outcome, an increase in data mining by 1% would cause a 0.087 increase in Audit outcome, an increase in big data analytics by 1% would cause a 0.158 increase in Audit outcome, an increase in robotics intervention by 1% would cause a 0.210 increase in Audit outcome and an increase in computer aided auditing tools by 1% would cause a 0.160 increase in Audit outcome. This result is consistent with a priori expectation as it was expected that CCT, DAM, BDA, RIN, and CAAT will have positive effects on AOE.

The coefficient of determination of Adjusted R squared which is the explanatory power of the model is 0.491. This implies that within the model context, the independence of audit innovative technologies is responsible for 51% variations in audit outcome while the remaining 49% is explained by other factors that can impact on the dependent variable outside the model. Hence, the coefficient of determination shows that the main model has a strong explanatory power. This further emphasized by the probability of the t-statistics indicating that this model is statistically significant.

The F-statistics at a level of significance of 0.05 is 49.085, with a p-value of 0.000, which is less than the 0.05 level of significance used in this analysis. The null hypothesis that Audits innovative technologies do not have significant effect on audit outcome of accounting firms in Nigeria was rejected. Therefore, from the regression estimates, Audit innovative technologies (cloud and cognitive technologies, data mining, big data analytics, robotics intervention, computer aided auditing tools) have a significant effect on audit outcome of accounting firms in Nigeria.

H_04: Audit innovative technologies have no significant impact on audit cost.

Table 4: Results of Regression Estimate Test of hypothesis Four

Variables	Coefficient	St. Error	T-stat	Prob
(Constant)	2.455	.972	2.526	.012
CCT	.049	.061	.803	.423
DAM	.211	.059	3.565	.000
BDA	.194	.063	3.067	.002
RIN	.251	.063	3.968	.000
CAAT	.159	.051	3.135	.002
Adjusted R^2	0.516			
F stats	54.019 (0.00)			

Dependent Variable: ACT
Source: Researcher's Field Survey Results (2022)

Model 4

$ACT = f\,(CCT,\,DAM,\,BDA,\,RIN,\,CAAT)$

$ACT_i = \alpha_0 + \beta_1 CCT_i + \beta_2 DAM_i + \beta_3 BDA_i + \beta_4 RIN_i + \beta_5 CAAT_i + \mu i$

$ACT_i = 2.455i + 0.049CCTi + 0.211DAMi + 0.194BDAi + 0.251RINi + 0.159CAATi + \mu i$

The result of the regression analysis for audit innovation technologies on Table 4 shows that the constant 2.455 shows a positive beta coefficient. The coefficient of the independent variable Audit innovative technologies proxies CCT, DAM, BDA, RIN, and CAAT is positive. This is indicated by the sign of the coefficients, that is $\beta_1 = 0.049>0$, $\beta_2 = 0.211>0$, $\beta_3 = 0.194>0$, $\beta_4 = 0.251>0$ and $\beta_5 = 0.159>0$. That is, an increase in cloud and cognitive technologies by 1% would cause a 0.262 increase in Audit cost, an increase in data mining by 1% would cause a 0.087 increase in Audit cost, an increase in big data analytics by 1% would cause a 0.158 increase in Audit cost, an increase in robotics intervention by 1% would cause a 0.210 increase in Audit cost and an increase in computer aided auditing tools by 1% would cause a 0.160 increase in Audit cost. This result is consistent with a priori expectation as it was expected that CCT, DAM, BDA, RIN, and CAAT will have positive effects on ACT.

The coefficient of determination of Adjusted R squared which is the explanatory power of the model is 0.516. This implies that within the model context, the independence of audit innovative technologies is responsible for 52% variations in Audit cost while the remaining 48% is explained by other factors that can impact on the dependent variable outside the model. Hence, the coefficient of determination shows that the main model has a strong explanatory power. This further emphasized by the probability of the t-statistics indicating that this model is statistically significant.

The F-statistics at a level of significance of 0.05 is 54.019, with a p-value of 0.000, which is less than the 0.05 level of significance used in this analysis. The null hypothesis that Audits innovative technologies do not have significant effect on Audit cost of accounting firms in Nigeria was rejected. Therefore, from the regression estimates, Audit innovative technologies (cloud and cognitive technologies, data mining, big data analytics, robotics intervention, computer aided auditing tools) have a significant effect on Audit cost of accounting firms in Nigeria.

H₀5: Audit innovative technologies have no significant impact on audit process.

Table 5: Results of Regression Estimate Test of hypothesis Five

Variables	Coefficient	St. Error	T-stat	Prob
(Constant)	11.268	1.593	7.075	.000
CCT	.090	.099	.903	.367
DAM	-.075	.097	-.774	.440
BDA	.083	.104	.804	.422
RIN	.066	.103	.636	.526

CAAT	.157	.083	1.889	.060
Adjusted R^2	0.043			
F stats	3.233 (0.008)			

Dependent Variable: APS
Source: Researcher's Field Survey Results (2022)

Model 5
APS = f (CCT, DAM, BDA, RIN, CAAT)
$APS_i = \alpha_{0i} + \beta_1 CCT_i + \beta_2 DAM_i + \beta_3 BDA_i + \beta_4 RIN_i + \beta_5 CAAT_i + \mu_i$
$APS_i = 11.268i + 0.090CCTi - 0.075DAMi + 0.083BDAi + 0.066RINi + 0.157CAATi + \mu i$

The result of the regression analysis for audit innovative technologies on Table 5 shows that the constant 11.268 shows a positive beta coefficient. The coefficient of the independent variable Audit innovative technologies proxies CCT, BDA, RIN, and CAAT is positive, and DAM is negative. This is indicated by the sign of the coefficients, that is β1 = 0.090>0, β2 = -0.075<0, β3 = 0.083>0, β4 = 0.066>0 and β5 = 0.157>0. That is, an increase in cloud and cognitive technologies by 1% would cause a 0.090 increase in Audit process, an increase in data mining by 1% would cause a -0.075 decrease in Audit process, an increase in big data analytics by 1% would cause a 0.083 increase in Audit process, an increase in robotics intervention by 1% would cause a 0.066 increase in Audit process and an increase in computer aided auditing tools by 1% would cause a 0.157 increase in Audit process. This result is consistent with a priori expectation as it was expected that CCT, BDA, RIN, and CAAT will have positive effects and DAM will have negative effects on APS.

The coefficient of determination of Adjusted R squared which is the explanatory power of the model is 0.043. This implies that within the model context, the independence of audit innovative technologies is responsible for 4% variations in Audit process while the remaining 96% is explained by other factors that can impact on the dependent variable outside the model. Hence, the coefficient of determination shows that the main model has a weak explanatory power. This further emphasized by the probability of the t-statistics indicating that this model is statistically insignificant.

The F-statistics at a level of significance of 0.05 is 3.233, with a p-value of 0.008, which is less than the 0.05 level of significance used in this analysis. The null hypothesis that Audits innovative technologies does not have significant effect on Audit process of accounting firms in Nigeria was rejected. Therefore, from the regression estimates, Audit innovative technologies (cloud and cognitive technologies, data mining, big data analytics, robotics intervention, computer aided auditing tools) have a significant effect on audit process of accounting firms in Nigeria.

Discussion of findings
Application of innovative technology explained about 46% variations in time spent on audit process and operations. Audit innovative technologies are responsible for 48% variations in audit engagement while the remaining 52% is explained by other factors that can impact on the dependent variable outside the model. The third model stated

that coefficient of the independent variable audit innovative technologies proxies (CCT, DAM, BDA, RIN, and CAAT), Audit innovative technologies is responsible for about 49% variations in audit outcome while the remaining 51% is explained by other factors that can impact on the dependent variable outside the model. The fourth model stated that coefficient of the independent variable Audit innovative technologies proxies (CCT, DAM, BDA, RIN, and CAAT) Audit innovative technologies is responsible for 52% variations in Audit cost while the remaining 48% is explained by other factors that can impact on the dependent variable outside the model, while the result of the fifth model stated that coefficient of the independent variable Audit innovative technologies proxies (CCT, BDA, RIN, and CAAT) Audit innovative technologies is responsible for 4% variations in Audit process while the remaining 96% is explained by other factors that can impact on the dependent variable outside the model. All the models where significant at 5% level of significant.

The outcome of this study aligned with contingency theory that plays an important role because when put into practice, it helps organizations undergo transformations more quickly and more efficiently using new technologies. Audit innovative technologies proxies by (CCT, DAM, BDA, RIN, and CAAT) exert significant impact on audit timing, audit engagement, audit cost, audit outcome and audit process. This result indicated that application of innovative technology will enhance the quality of audit and provide appropriate solution to the menace of audit failure which have ravaged the corporate entities across all sectors of the economy.

The study of Kroons, Alves and Martins (2021) supported the results found in this study that auditors' fees skyrocketed in direct proportion to the amount of money invested in innovation activities and capitalized R&D. Le, Tran, and Vo (2021); Lavinia (2020) findings aligned with our observation when their studies submitted that e-Audit System Implementation was more successful when the auditors were competent in using information technology, according to Similarly, the findings of this study are corroborated by other studies such as Umar, Erlina, & Fauziah, (2019), Khajavi and Zare (2016), Akinwunmi, Dada, Owoeye & Kwarbai, (2020). Which concluded that audit failure is associated with corporate failures across the globe, such as Patisserie Valerie in the UK (2018), Steinhoff in South Africa (2018), Kingdom Bank Africa Limited and Choppies Limited in Botswana (2015, 2018 respectively), Skye Bank now and Polaris Bank Cadbury Nigeria Plc and African Petroleum; Savannah Bank and African International Bank; Nampak, Finbank, and Spring Bank; Intercontinental Bank Plc, Oceanic Bank Plc, and AfriBank Plc; and Intercontinental Bank Plc, Oceanic Bank Plc, AfriBank Plc, Cadbury Nigeria Plc and African Petroleum in Nigeria are somehow associated with audit failure.

In other studies by Hanh, and Soa (2020); Wadesango and Nyakuera (2020); Lavinia (2020) as Umar, Erlina, & Fauziah, (2019); Khajavi and Zare (2016); audit quality was related to the deployment and application of technology based initiatives which are intended with empirical discovery of this study.

Based on the findings from this study, the study therefore concluded that adoption, application and implementation of innovative technology into audit process, operations and engagement exert significant impact on the audit timing, audit engagement, audit cost,

audit output and processes. The study therefore recommends the audit firms to invest into IT R&D related activities, accusations and implementation of innovative audit technology for data mining, visualization, automation process, CAAT among others to improve the quality of audit output.

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