ADOPTION AND IMPACT OF ARTIFICIAL INTELLIGENCE TOOLS ON AUDIT PRACTICES AMONG SMALL AND MEDIUM AUDIT FIRMS IN OYO STATE

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Abstract

Artificial Intelligence is gaining preeminence in the developed nations of the world and usage of AI tools for audit practice among the auditing firms is increasing. However, many developing countries in which Nigeria is not an exemption are at the early phase of utilization of AI tools. Also, research focus has been on the Big 4 auditing firms with little or no consideration for small and medium audit firms operating in Nigeria. This study seeks to examine the adoption and impacts of Artificial Intelligence technologies among small and medium auditing firms in Oyo State. Survey research design is employed for the study. The population of the study comprises of all the registered small and medium audit firms operating in Ibadan metropolis, while the sample size of 40 firms is purposively selected. Data are obtained through a well-structured questionnaire. In analyzing the data, descriptive and regression analysis techniques are used. The results of the study show that on the average, the sampled auditing firms embraced the usage of expert system tool and data mining tool. However, machine learning, and image recognition are yet to be fully incorporated into auditing practices. Furthermore, there exist a significant positive relationship between adoption of AI tools and audit quality. The study recommends that there should be awareness and training of audit staff on the usage of machine learning and image recognition among the small and medium auditing firms.

Keywords: Artificial intelligence, Expert system, Data mining, Machine learning, Image recognition.

1. INTRODUCTION

There is increase in the usage of digital technology daily by all facets of life, most particularly in the business sector. Artificial Intelligence being the simulation of human intelligence processes by machines, especially computer systems is a term first invented by John McCarthy, a renowned computer scientist, in 1955. According to Hernandez-Orallo (2017), artificial intelligence is referred to as 'the science and engineering of making intelligent machines'. Artificial intelligence is gaining recognition speedily as a result of increase in big data and advances in computing power; in fact, it has dominated the business environment and public discussions (Haenlein & Kaplan, 2019). Accounting profession in which auditing is inclusive has witnessed tremendous change as a result of this new and smart technologies. These innovative technologies advancing and revolutionizing traditional practices of carrying out business operations has changed auditors' approach to audit engagements. Auditors, now see the need to embrace the usage of these technology-based tools in order to manage the increasing vast volume of data being generated by clients. In spite of the different transformation that the audit profession has witnessed over the years due to advancement in technology, the main thrust of the profession according to Omoteso (2012) is to 'provide independent third-party opinion on the truth and fairness of financial information' prepared by the company's management in compliance with relevant regulatory standards.

Furthermore, artificial intelligence (AI) technologies appeared to be a key enabler offering great benefits by redesigning the auditing profession and giving the auditors a competitive edge. Accounting and auditing services are gradually embracing the use of artificial intelligence technologies as effective tools for automating tasks which includes data extraction, entry and analysis, audit sampling for streamlining the audit process, detection of fraudulent activities and financial misstatements thereby enhancing the quality of audit work (Fedyk, Hodson, Khimich and Fedyk, 2022). Furthermore, the increasing need for timely and reliable financial report by stakeholders, constant review of regulatory requirements and increasing complex financial transactions have increase the need for auditors to embrace the use of AI technologies (Busayo, Igbekoyi, Oluwagbade, Adewara, Dagunduro and Boluwaji, 2023).

In this era of knowledge-based economy, it was predicted that technology has the ability to replace some accounting roles. Due to the nature of some audit tasks which are structured and monotonous, artificial intelligence with the use of robotic automation can perform some accounting tasks which includes procure-to-pay, internal performance reporting, scripts writing, and so on. The adoption of artificial intelligence tools may not completely erode human prowess and decision-making ability. Although, AI tools like expert systems and machine learning has positively affected the accounting profession, however, it comes with its attendant problems of data security and potential displacement of personnel, that is why auditors must continually acquaint themselves with the technical requirements of their job.

Although, research works were carried out on how AI can influence audit practices (Fedyk, et al. 2022; Akinadewo et al., 2024). However, the results of the empirical review done for studies in Nigeria show that paucity of studies exist. In addition, some of the research studies empirically focused on the Big 4 auditors, giving less consideration for smaller audit firms. Hence, the objective of this study is to examine the adoption and impact of artificial intelligence tools among small and medium sized audit firms in Oyo State. The study is important because it reveals the type of artificial intelligence tools currently adopted by the firms; add significantly to body of knowledge and shows the benefits derived from the usage of these AI tools in order to further encourage these firms to embrace the utilization of these tools so as to improve on their audit process and output.

Based on the objective of the study, the research hypothesis formulated for the study is given as:

H_0: Adoption of artificial intelligence tools does not impact the audit practices of small and medium audit firms in Oyo State.

2. LITERATURE REVIEW

This section contains the review of pertinent concepts, theories, past empirical studies for the purpose of bringing out the gap in literature.

2.1 Conceptual Review

Artificial Intelligence

In 1956, a renowned American Computer Scientist, John McCarthy was the first to use the term "Artificial Intelligence" (AI) at the workshop held at Dartmouth College. According to McCarthy, AI is "the science and engineering of making intelligent machines" (Hernández-Orallo, 2017). It can also be seen as a multidisciplinary field incorporating knowledge from various disciplines that includes computer science, biology, statistics, medicine, finance, arts in order to generate computer systems that can imitate human skills and abilities. It is believed that this computer systems created will possess some intellectual characteristics of humans such as ability to reason, discover meaning, generalize or learn from past experience. Also, it has been demonstrated that computers can be programmed to carry out complex tasks for different fields of study in which accounting is inclusive. The increasing complexity of business operations has made the application of artificial technology more vital (Das, 2021). In fact, as a result of continuous improvement in computer technology some big auditing firms have incorporated A.I. into their audit automation systems specifically for creating audit judgements (Omoteso, 2012). Effective utilization of AI in auditing is expected to enhance the quality of audit work, it represents the future of accounting profession. Some of the artificial intelligence tools being used in auditing practices are explained below.

Expert systems

This is a computer-based system that uses AI techniques to imitate decision making ability of an auditor. Expert system can be employed for detection of anomalies, financial data analysis, proffering of intelligent recommendations. According to Omoteso (2012), application of expert system is highly beneficial to audit profession in the area of knowledge transferability, tasks process implementation and proper test sampling of data free of error especially for firms with large data.

Data mining

This is an information processing system that analyzes large amount of data in order to create patterns and correlations for solving business issues and challenges so as to make economic and prudent decisions. It can be used to predict future operational trends for business organizations. As a result of possible manipulations of financial accounting information via technological instruments and online systems, the need for data mining in auditing has significantly increased (Akinadewo et al., 2024). Also, this tool may help to simplify audit procedures.

Machine learning

This applies statistical models and algorithms to identify patterns and risks, analyze financial data and so on. With the help of this tool, auditor can process vast amount of data proficiently, detect anomalies and fraud, predict future trends.

Image recognition

This can be referred to as picture recognition or photo recognition. This tool help to identify and classify objects in an image. After classifying the objects into different groups, it will label each group and help to ascertain what each denotes. Generally, this tool has been utilized in auditing practices for performing different machine-based visual and pictorial tasks. It can be used in retail store audits and area of fraud detection; although its application is still evolving among the auditing firms in most of the developing nations of the world.

Artificial Intelligence and Audit practice

Artificial intelligence represents computer systems or machines that have the ability of imitating human intellectual functions. A.I. integrates smart technologies which enhances the efficacy of business operations. Audit which involves the work of an independent auditor is the expression of an opinion as regards the true and fair view of the financial statements prepared by the company's management. An auditor helps to establish the accuracy of financial accounts provided by the company. The utilization of A.I. is vital in auditing as a result of vast growing complexity of business operation and processes. It helps to automate various auditing tasks and audit procedures thus aiding forecasting and strategic decisions making.

A.I. which is a computerized system has the capacity to analyze and evaluate data, used in sampling data as well, conduct audit tests and aid in report writing. Auditors make use of different artificial intelligent tools for various purposes. These tools help them in their audit procedures for obtaining reliable audit evidence while carrying out the audit engagements. It is essential for auditors to obtain reliable evidence in the course of the audit work because it forms the basis of their conclusions in expressing their opinions on the clients' financial statements and account. Audited financial statements provides high level of assurance to stakeholders.

2.2 Theoretical Review

This study is anchored on two theories which are agency theory and resource-based theory. Agency theory being one of the main significant theories in auditing was developed by Jensen and Meckling (1976). Agency theory describes agency relationship as a contract which exist between two parties in which one who is known as the principal otherwise called the shareholders engage another person who is referred to as the agent also known as the management to execute some duties on behalf of the principal which includes overseeing business operations and activities. However, as a result of divergent of interests between the two parties since they are 'utility maximizers', there is always a conflict of interests because most times, the agent will not always act in favor of the principal. According to Al-Shaer and Zaman (2018), conflict of interest between the two parties may affect the reliability of the financial statement by the shareholders and therefore in order to restore financial statement reliability, it is important that an independent auditor is assigned by the principal to review the work of the agent. Auditing, which is the major means by which the principal can reduce divergences of interest has associated costs known as monitoring costs and is believed to limit the deviant activities of the agent.

Auditors help in managing the agency relationship, review and express independent opinion on the financial statements and accounts prepared by the management. It is important that shareholders have confidence in auditor's report. It is important for auditors to embrace the usage of artificial intelligence tools so as to be able to meet the demands of their clients. As put forward by Akinadewo et al. (2024), "Auditing of financial statements is made easier by the use of artificial intelligence, thus lessen the conflicts of interests and bringing into reality agency theory's objectives".

The concept of resource-based theory was put forward by Penrose (2009). Resource-based theory opined that "organizations that own strategic resources have important competitive advantages over organizations that do not". A resource is valuable to the extent that 'it helps a firm create strategies that capitalize on opportunities and ward off threats'. An organization's resources are tangible and intangible assets in which knowledge of technology is inclusive. Artificial intelligence tools are essential resources (intangible assets) for a corporate organization in achieving a continued 'competitive advantage and performance advancement' (Lou & Wu, 2021). Application of artificial intelligence technologies in auditing is important as it lessen the time at which auditor spend on audit procedures, help in accurate audit sampling and detection of material misstatement thereby enhancing the audit quality (Akinadewo et al., 2024).

2.3 Empirical Review

In recent times, several empirical studies both in developed and developing countries have been carried out on adoption and importance of AI in accounting field. Akinadewo et al. (2024) conducted research in Nigeria on how artificial intelligence can impact audit practice among 159 audit firms. The study employed the use of structured questionnaires in order to gather data, correlation and regression analysis were used in analyzing the data. The study reported that two of the artificial intelligence tools namely image recognition and data mining had positive impact on audit practice among the sampled firms. Likewise, Oluwagbade et al. (2024) critically examined the challenges as well as the opportunities that could be derived as a result of implementing AI tools in the auditing practices among the sampled registered auditing firms operating in Lagos State. The data for the study was collected through the administration of questionnaire and the data was analyzed by employing both descriptive and inferential statistics. The study reported that one of the AI tools that is machine learning offers great benefits and can help to overcome the major challenges being experienced by the audit practitioners.

Owonifari et al. (2023) examined the "relationship between artificial intelligence and audit practice effectiveness among 62 accounting firms located at Ikeja the capital city of Lagos state, Nigeria". The data for the study was gathered through the use of questionnaire and it was concluded that audit practice has been improved upon due to the application of some artificial intelligence tools. Furthermore, Dagunduro et al. (2023) investigated on how various AI tools influence audit practice in Nigeria. By employing survey research design, the study sampled 125 practicing accounting firms and the data gathered were analyzed using descriptive and inferential statistics. The result of their study informed that audit quality is positively affected by artificial intelligence tools which are intelligent agents, expert systems and machine learning. Aljaaidi, et. al. (2023) carried out a study titled "the impact of using artificial intelligence applications on the performance of accountants and audit firms in Saudi Arabia". The data collected for the study was through the survey-based method that is questionnaires were administered to respondents. The study found that application of artificial intelligence tools is greatly perceived to be helpful for audit firms by improving their performance through the reduction of time, expenses and effort spent on the audit engagements thus giving them competitive advantage. An exploratory study as regards the effect of artificial intelligence adoption on accounting profession was carried out by El-Mousawi et al. (2023). The study employed quantitative method by administering questionnaire to 337 certified public accountants in Lebanon. The findings disclosed that adoption of artificial intelligence enhances financial data accuracy and helps in solving complex accounting issues.

Fedyk, et al. (2022) carried out an assessment on the influence of artificial intelligence on audit quality. The study was executed by sourcing for data through semi-structure interviews among the sampled public accounting firms operating in United States of America (U.S.A). Data obtained were analyzed through the use of descriptive and inferential statistics. The findings from the study confirm that investment in A.I would lead lessen financial statement material restatements, audit fees and ultimately increase audit quality and efficiency. In addition, Awotomilusi et al. (2022) examined the link between cloud computing adoption and accounting practices effectiveness. The study sampled listed deposit money banks in Nigeria through the administration of questionnaires. The study reported that accounting practices can be improved upon through the adoption of cloud computing. Al-Sayyed et al. (2021) empirically conducted a study on how the adoption of artificial intelligence (AI) tools has affected audit evidence by sampling 314 certified auditors operating in IT firms in Jordan. Data was collected through the administration of questionnaire and the study concluded that among the AI tools tested for, expert system had positive influence on audit evidence. Stancheva-Todorova (2018) conducted a study on the topic titled "How Artificial Intelligence is Challenging Accounting Profession". By employing qualitative research approach, the study reviewed relevant published journal articles and disclosed that artificial intelligence if highly integrated into the profession can help to reform the accounting profession by creating opportunities for innovative roles and tasks.

3. METHODOLOGY

This study was conducted by employing survey research design for the purpose of achieving the objective of the study. Forty small and medium sized audit firms operating in Ibadan the metropolis and capital city of Oyo State were chosen by purposive sampling technique. Purposive sampling technique was employed for this study in order to ensure that target audience were reached that is firms that have adopted the use of one or more of these artificial intelligence tools were selected. A well-structured questionnaire was administered to auditors of these sampled firms for the purpose of obtaining primary data for the study. The data collected for the study were analyzed using the descriptive and inferential statistics.

Model Specification

To examine the adoption and impact of AI tools among the small and medium audit firms, the study constructs the underlisted models in line with the work of Akinadewo et. al. (2024).

$$AP = f(ES, DM, ML, IR) \quad (1)$$

Restating the model in econometric form (with the introduction of error term) will give:

$$AP = \beta_0 + \beta_1 ES + \beta_2 DM + \beta_3 ML + \beta_4 IR + \mu \quad (2)$$

Where:

AP = Audit practice
ES = Expert system
DM = Data mining
ML = Machine learning
IR = Image recognition
μ = Error term
β_0 = Constant
$\beta_1 - \beta_4$ = Coefficient of the explanatory variables.

4. RESULTS

This section reveals the results of the analysis carried out for the study.

4.1 Reliability Test

To assess the reliability of the questionnaire employed for the study, Cronbach's Alpha test was used and the results are displayed in Table 1 below. As shown in Table 2, all the variables tested have values higher than the benchmark value stipulated as 0.7. Thus, it can be concluded that the research instrument is reliable.

Table 1: Cronbach Alpha Test Results

S/N	Variables	No. of Items	Cronbach's Alpha
1	Audit Practice (AP)	6	0.810
2	Expert System (ES)	5	0.809
3	Data mining (DM)	5	0.729
4	Machine learning (ML)	5	0.729
5	Image recognition (IR)	5	0.711

Source: Authors' Computation, 2024

4.2 Descriptive statistics

Table 2 shows the descriptive statistics of the variables employed for the study. The average values for audit practice, expert system, data mining, machine learning and image recognition are 3.72, 3.63, 2.85, 3.07, 3.11 respectively while the standard deviation values for the same set of variables are 1.51, 1.96, 1.05, 1.87, 1.09 respectively. This implies that the mean values are higher than the standard deviation values that is, the data clustered around the mean. The skewness values for the variables employed for the study are -0.07, -0.51, -1.08, -1.64, -1.54 and this suggests that they are negatively skewed.

Table 2: Descriptive statistics of the variables employed for the study.

Variables	**AP**	**ES**	**DM**	**ML**	**IR**
Mean	3.72	3.63	2.85	3.07	3.11
Minimum	1.05	1.04	1.05	1.03	1.02
Maximum	4.00	4.00	4.00	4.00	4.00
Standard deviation	1.51	1.96	1.05	1.87	1.09
Skewness	-0.07	-0.51	-1.08	-1.64	-1.54
Observation	40	40	40	40	40

Source: Authors' Computation (2024)

4.3 Linearity Test

Table 3 reveals the statistical results of the correlation analysis showing the relationship between adoption of artificial intelligence tools and audit practice among the sampled audit firms in Oyo state, Nigeria. Specifically, the table shows that expert system has a significant correlation coefficient of 0.512 with audit practice. This implies that an increase in the usage of expert system tool will have direct influence on audit practice. Data mining is significantly related with audit practice with statistical values of 0.268. However, machine learning and image recognition do not have significant relationship with audit practice. Lastly, there is no problem of multicollinearity among the explanatory variables because none of their correlation coefficient values is up to 0.7, which is the bench mark set.

Table 3: Correlation analysis of the variables employed for the study

Variables	AP	ES	DM	ML	IR
AP	1.000				
ES	0.512** (0.000)	1.000			
DM	0.268** (0.002)	0.165** (0.000)	1.000		
ML	0.374 (0.060)	-0.364** (0.036)	0.265** (0.000)	1.000	
IR	0.298 (0.516)	0.159** (0.000)	0.140** (0.000)	0.051 (0.062)	1.000

** Correlation is significant at 0.01 level; * Correlation is significant at 0.05 level.
Source: Authors' Computation (2024)

4.4 Regression results

Table 4: Regression results for Impact of Artificial Intelligence Tools on Audit Practices of Sampled Firms.

Variables	Coefficient	t-Statistics	Prob. Values
C	0.760	5.582	0.000
Expert system	0.302	2.714	0.006
Data mining	0.261	3.612	0.002
Machine learning	0.040	1.081	0.570
Image recognition	0.071	1.320	0.112
R-squared	0.612		
Adj R-squared	0.609		
F-stat.	119.510		
Prob (F-statistics)	0.000		

Source: Authors' computation (2024)

The results of the regression analysis used in estimating the adoption and impact of artificial intelligence tools on audit practices of small and medium audit firms in Oyo State is presented in Table 4 above. Audit practice represent the explained variable while data mining, expert systems, image recognition, machine learning and neural network represent the explanatory variables. Mathematically, the relationship can be expressed in the model stated below:

$$AP = 0.760 + 0.302Es + 0.261Dm + 0.040Ml + 0.071Ir$$

The coefficient value of R^2 is 0.612 and the adjusted R^2 value is 0.609. This implies that approximately 61% of the variation in audit practice among the sampled audit firms can be explained by expert systems, data mining, machine learning and image recognition; while 39% can be attributable to other determinants that are captured by the error term. The value for F-statistics is 119.510 with a P-value of 0.000 reveals that the model for the study is statistically significant and provides a good fit. Furthermore, the coefficient value for expert system of 0.302, with t-statistics value of 2.714 and probability value of 0.006 indicates that there exists a significant positive relationship between adoption of expert system tool and audit practice, that is a unit increase in expert system will cause audit practice to improve by 0.302 unit. Data mining has a coefficient value of 0.261 with a t-statistics value of 3.612 and a prob. value of 0.002 signifies that data mining has a significant positive effect on audit practice, that is a unit upward movement in data mining will make the audit practice to increase by 0.261 unit. However, both machine learning and image recognition have positive influence on audit practice but are not statistically significant with t-statistics values of 1.081 and 1.320 and prob. values of 0.570 and 0.112 respectively.

Discussion of Findings

This study assessed the adoption and impact of artificial intelligence tools on audit practice among the small and medium audit firms in Oyo State. The empirical results show that expert system and data mining have significant and positive association with audit practice for the sampled firms; that is usage of expert system tools for audit process can help in audit planning, internal control analysis and enhance decision making (Dagunduro et al., 2022; Chen et al., 2018; Al-Shaer & Zaman, 2018). In addition, it was reported that implementation of data mining tools into the audit process, directly impact audit practice by helping with sorting of large data within short time frame, forecast future trends, conduct effective audit sampling and enhance audit practice efficiency. This result is in line with the prior studies carried out by (Akinadewo et al., 2024; Owonifari et al. 2023; Al Sayyed et al. 2021).

Finally, it has been revealed by the empirical findings of the study that adoption of these artificial intelligence tools which are expert systems and data mining have great and significant impacts on audit practice of small and medium audit firms in Oyo State. The findings from this study corroborates the assertion of resource-based theory which posit that effective and efficient utilization of intangible asset(s) can enhance firm's productivity and as well as give it competitive advantage thereby increasing the firm's revenue. It can be inferred that auditors need to embrace the usage of these artificial intelligence tools so as to gain competitive advantage and improve their audit practice efficiency.

5. CONCLUSION AND RECOMMENDATION

This research study examined the adoption and impact of artificial intelligence tools on audit practices among small and medium audit firms in Oyo State. Descriptive and regression analysis were used in achieving the objective of the study. The findings from the study concluded that usage of expert system tools and data mining tools greatly impact audit practices in Oyo state as evidenced by the results which show that there exists a significant positive relationship between expert system and quality of audit practices in Oyo state. Also, the result

reveal that data mining has significant positive effect on the quality of audit practices. That is, effective utilization of these tools can enhance the quality of audit practices, although, the adoption of these tools among the small and medium audit firms is still emerging. With respect to these findings, the study recommended that there should be training and re-training of audit staff on the usage of artificial intelligence tools as this will encourage them to further embrace the usage of these tools.

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