

The Efficiency of Adopting Generalized Audit Software in Internal Auditing: A Case Study of Internal Auditors in Nigeria

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Abstract – The importance of Generalized Audit Software (GAS) and its benefits have been studied in developed countries. However, the benefits of GAS are not as widely researched in developing countries like Nigeria. This study was designed to investigate the efficiency of adopting GAS in internal auditing in Nigeria. The study employed the use of questions in questionnaires which were used to gather information from 120 internal auditors at 12 different firms within Nigeria. The Data was analyzed using the Principal Component Analysis (PCA). It was found that factors such as resource constraints, communication and collaboration, and training of internal auditors affected the adoption of GAS, thereby limiting its efficiency in Nigeria. The study also found that GAS adoption can improve and increase the efficiency of internal auditors in Nigeria. The study recommended the need to enhance communication and collaboration among GAS users as well as other key stakeholders in Nigeria.

Keywords – Audit, Computer-Assisted Auditing Tools and Techniques, Fraud, Generalized Audit Software, Internal Audit, Software Skills

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1 Introduction

Auditing is a key requirement by the law to improve and ensure that the financial reports and statements prepared by organizational accountants and managers, who are bestowed with that responsibility, are trustworthy according to Eze (2016). Organizations are therefore, demanded to establish separate robust units for internal auditing to ensure the accuracy of the financial reports prepared and submitted by the organization (Abiola, 2013). To improve organizational performance, internal auditing acts as a means of adding value to improve the organization's operations (Alao & Lawal, 2018). Generalized-Audit Software is computer-assisted auditing software designed to improve organizations' internal and external auditing (Al-Okaily et al., 2022).

According to Braun & Davis (2003), one of the key technologies used by auditors is computer-assisted auditing tools and techniques (CAATs) to hasten the completion of audit tasks. The usage of CAATs entails that auditors use specialized computer programs to carry out audit and audit-related work (Sayana, 2003; Awuah et al., 2022).

In their opinion, Smidt et al. (2019) maintained that auditors can leverage CAATs in their audit work, which includes the processing of financial data. Auditors can use various CAATs to carry out their auditing work. In addition to improving the performance of the auditing profession, CAATs also contribute to helping auditors about their quality, accuracy and timeliness. All this reinforces the efficiency of auditing as a profession (Aziz et al, 2010; Berkowsky et al, 2017; Boden et al, 2020).

CAATs speed up the performance of labor-intensive tasks that helps auditors to work efficiently (Bradford & Henderson, 2017). One of the ways CAATs help auditors is by making it faster for them to carry out tests on internal controls, align with the applicable standards and statutes, enhancement of the internal control effectiveness as well as the improvement of fraud detection (Bradford et al, 2020; Coetzee et al, 2015; Cooper et al, 2009).

As stated by Braun & Davis (2003), CAATs have five categories, namely data testing, integrated test facilities, parallel simulation, embedded audit modules, and generalized audit software (GAS). Out of these, GAS has been the most popular among auditors across the globe (Singleton, 2006; Creswell, 2012). It is software used by auditors to assess the accuracy, reliability, and risks associated with systems, according to Ahmi (2012) and Widuri (2014). GAS improves the efficiency and effectiveness of auditors by allowing them to focus more on their core tasks while increasing their audit quality (Isabelle & Hywel, 2015; Curtis & Payne, 2014).

There are various GAS options available. These include Statistical Package for Social Sciences (SPSS), Interactive Data Extraction and Analysis (IDEA), TopCAATs, ActiveData, etc. (Singleton, 2006). Larger audit organizations may opt to develop their customized GAS. There are many functions provided by GAS to assist auditors in auditing. These include scanning, ex-

aming, classifying, scrutinizing, differentiating, calculations, translation, analysis, and summarizing (Ahmi & Kent, 2013).

Auditing has been described by Dicey (2018) as one important aspects of corporate governance as it helps to ensure that finances and operations of the organization are in line with the acceptable standards. Further, auditing helps to correct abnormalities and detect fraud from the onset (Dicey, 2018). Poor auditing leads to poor financial integrity, thereby giving the stakeholders a misrepresentation of the true nature of the organization's operations (El-Tahan, 2016; Eulerich et al, 2020).

According to a recent report by the Institute of Internal Auditors (IIA), the internal audit profession in Africa is still emerging, indicating that the professionals in the region need to do more to catch up with the rest of the world (Mexmonov, 2020). As a result, the adoption and usage of auditing software have been inadequate and slow among the auditors in the region (Mexmonov, 2020). Abiola (2013) suggests that audit, as a profession, has not matured in the region, particularly Nigeria. The maturity ranges from "established" to "initial" for public and private companies, respectively (Groff et al., 2016).

The Nigerian financial system has been plagued by a myriad of corporate financial scandals in recent years comprising everything from fraudulent practices to poor management (Ikponmwonsa et al., 2020). These cases have resulted in lost investments and brought the system to near collapse. In addition, it has also contributed towards a loss of integrity in the Nigerian financial system (Olabisi et al, 2018). A major cause of the recurrence of financial fraud in the system is non-adoption and application of GAS in internal audit (Oladejo et al, 2017). According to Smidt (2016), a considerable number of the respondents in his study still practice manual processes while performing their audit tasks. This process is tedious, labor-intensive and full of human errors.

To a large extent, GAS corrects most of the errors that are inherent in manual auditing. Hence, it is required to analyze the effectiveness of using GAS in internal auditing and then advise the governing body in Nigeria.

Besides, a lot of research has been done in this field, mainly to address the effectiveness of computer-assisted audit techniques (CAATs) in developed economies (Lowe et al., 2018). Nonetheless, though it is clearly required, the literature on the adoption and performance of GAS use in Nigeria is sparse. The study aimed to effectively bridge this gap by focusing on the specific issues and solutions regarding the use of GAS by internal auditors in Nigeria.

Research Questions

- Does the implementation of GAS have any impact in the efficiency of internal auditors' practices in Nigeria?
- Are there challenges and barriers encountered by internal auditors in the process of adopting and integrating GAS as part of their auditing process?
- What are the key success metrics and best practices in the usage of GAS by internal auditors as part of their auditing process?

- Does the efficiency gained through the adoption of GAS transform into better audit quality and value addition as part of internal auditing?

2 Literature Review

2.1 Historical overview of GAS

The history of Generalized Audit Software (GAS) in Internal audits is very long as the root dates to the Sixties (Aldridge & Deavours, 2017). In the beginning, GAS was trying to create a system that would automatically detect and fix errors and inconsistencies in data files. GAS is now a more elaborate tool that can be applied to diverse auditing activities such as data extraction, analysis and visualization.

The auditors of the 1970s, following the introduction of newer techniques and tools, were able to undertake larger data analysis projects (Bragg, 2017). This was a landmark in the growth of GAS. Examples of such audit software include ACL and IDEA, which had a graphical user interface enabling auditors to perform complex data analysis tasks more effectively. GAS grew from a simple file verification tool to an advanced audit software that auditors could use for diverse audit engagements, thanks to these software tools.

With a wide range of new feature introductions, GAS has shown incredible developments during the 1980s and 1990s in developmental stages, from macro programming to database accessibility to statistical analysis tools (Katz & Ronen, 1995). More complex audit tasks like fraud detection and financial statement analysis are now feasible due to technological advancements that have taken place recently. Besides, the wide acceptance and popularity of personal computing technology around that same period also meant that using GAS was now much simpler and did not demand special-purpose hardware like mainframes and minicomputers.

2.2 Theoretical literature

Theory of Planned Behaviour (TPB)

In the 1980s, Icek Ajzen developed the Theory of Planned Behaviour by expanding the Theory of Reasoned Action (TRA). The theory seeks to explain or predict people's behaviour by considering three key factors that influence people's behaviour. These factors are attitude towards the behaviour, subjective norms, and perceived behavioral control. An individual's attitude shows their positive or negative judgements regarding their behaviour; subjective norms include social pressure and influence, as well as perceived behavioral control, which pertains to the perceived ease or difficulty of performing the behaviour (Ajzen, 1991).

In the application of the TPB framework in the current research study, the study focused on the perceptions of the auditors of positive and negative aspects associated with the implementation of GAS technology. The re-

search specifically explored the issues that influence the decisions of internal auditors towards making decisions on whether integrating GAS into their audit process would be good or not.

Technology Acceptance Model (TAM)

Davis (1989) first proposed the theory, which has been refined by other scholars subsequently by providing more knowledge into how users welcome and accept new technologies. When it comes to internal auditing, TAM helps explain the acceptance of GAS, using the perceived usefulness of GAS as a key factor. (Davis, 1989; Venkatesh & Davis, 2000).

Increased adoption of GAS by internal auditors may occur when they recognize the role it plays in streamlining tasks in addition to conducting sophisticated data analysis on large datasets. Internal auditors can achieve a more efficient and effective audit process through automation of the audit process when they leverage GAS. This aligns with the principles of both TPB and TAM in the context of adopting GAS for internal auditing practices in Nigeria.

Empirical Literature

According to the study by Ele & Okoli (2023), to determine the audit software skills required by internal auditors for effective services in fraud control in federal universities located in South-South Nigeria, having the required computer skills is important for internal auditors for them to be able to detect indicators of fraud. The researcher raised two important research questions and two hypotheses to guide the achievement of the research study's aim. The research also used survey research design to gather the needed data. 365 internal audit staff of six federal universities in the South-South, Nigeria, make up the population of the study. The research study also framed a 16-item questionnaire with the title "Audit software skills required by internal auditors for an effective fraud control questionnaire." The Cronbach alpha reliability coefficient was 0.95 overall. In the analysis of the collected data, we utilized the mean and standard deviation. A T-test used to test the null hypotheses at the 5% level of significance. It was found that internal auditors in the institutions require continuous, generalized audit software skills for efficient fraud control measures. The study recommended that adequate provisions should be made by the university stakeholders to ensure adequate internet connection, as this will help improve the ICT skills of the internal auditors for fraud control.

The study by Adebayo and Olugbenga (2012) observed that technological advancements have pushed the old method of auditing out of relevance. The use of the traditional auditing system did not provide the required accuracy, efficiency, quality, and professional standard in auditing processes. Therefore, the increasing growth and intricacies of businesses have made manual auditing methods incapable of performing their functions adequately. As a result, the adoption of computer-based auditing software that can perform large dataset analyses and other repetitive functions of auditors has become important. Computer-based auditing software has led to time savings in conducting auditing tasks as well as better fraud detection by internal auditors. The study concentrated on the key issues that affect the adoption of CAATs in public limited liability establishments in Nigeria. Based on the selected audit firms in Lagos, a sample of 82 internal auditors was randomly drawn.

The Efficiency of Adopting Generalized Audit Software in Internal Auditing: A Case Study of Internal Auditors in Nigeria

The study used Chi-square analysis in the analysis of the dataset collected. It was found that the adoption of CAATs increases the accuracy of the internal auditors' reports. Furthermore, the study revealed improved retrieval of data. The study concluded that all aspects of the accounting profession have been affected by the increasing penetration of computer-based auditing software. They recommended that audit firms get going with auditing software as a matter of urgency, as this will improve their auditing reports. Again, providing adequate training for auditors regularly should be made a top priority, as this will keep them most efficient in the use of new auditing technologies.

Normahazan et al. (2020), in their research on the factors that contribute to the adoption of GAS within audit firms that are situated in Malaysia's central region, stated that a lot of old and upcoming businesses are adopting and implementing computer-based operations in their business activities. Their study maintained that the GAS is one of the most suitable auditing software that allows auditors to perform their tasks efficiently and effectively. The development of GAS in the field of audit is still very low, though a lot of practitioners maintain that auditors can benefit more by using GAS in their auditing processes. The study used the questionnaire method to generate the needed data from small-sized audit firms that were fully registered with the Malaysian Institute of Accountants (MIA). Using multiple regression analysis, the researchers analyzed only the 96 responses that met the basic requirements. The study revealed the performance expectation, effort expectations and facilitating conditions as indicators of adoption and implementation of GAS by audit firms in Malaysia. The study, however, did not reveal any substantial effects of social influence on the adoption and implementation of GAS.

In their research, Widuri & Yapa (2016) discovered that GAS implementation can dramatically improve audit efficiency, time and effort required for the task performance as well as increase audit coverage and accuracy. In another study, Martin and Vasarhelyi (2018) found that GAS can help auditors identify fraudulent activities, errors, and irregularities more efficiently than manual methods.

According to Olaoye & Kolawole (2020) who investigated the effect of information system on audit efficiency of selected local practicing firms in the North Central part of Nigeria. Using a survey design, the study obtained and analyzed primary data using frequency distribution and multiple regression analysis. The study found that the overall influence of information system on audit efficiency of the local firms is significantly positive. Again, the study found that performance expectation (PE) and effort expectation (EE) have positive and significant influence on audit efficiency of the local audit practicing firms. The study concluded that the information system implementation (i.e. PE and EE) has positive and significant relationship with audit efficiency. The researchers recommend that local audit practitioners with small sized audit firms should implement information system in their audit systems in order to improve the efficiency and effectiveness of the audit outcomes.

Adeyanju & Adenikinju (2022) looked at how innovations in information technology had increased the desire for CAATs in auditing processes.

The Efficiency of Adopting Generalized Audit Software in Internal Auditing: A Case Study of Internal Auditors in Nigeria

They pointed out how the use of CAATTs have been used in the banking industry to detect frauds. Their study examined how the adoption of CAATTs in fraud detection are perceived by deposit money banks in Nigeria. The study used a structured questionnaire and research survey to generate primary data from 20-listed DMBs as well as the big-four audit firms in Nigeria. 199 of the questionnaires were analyzed using frequency tables, histograms, bar-charts, and Kruskal-Wallis test on SPSS. The result showed that there is a slight adoption of CAATTs among banks in Nigeria. Again, the auditor's educational level was found to be a major factor on the adoption of CAATTs by the auditor. In conclusion, the study stated that educational exposure of the auditor is a key determinant in the adoption of CAATTs for fraud detection among banks in Nigeria. The study recommends that CAATTs should be included into the present auditing processes and laws by the policy makers in Nigeria.

For Olojede, P., & Olayinka, E. (2022), auditing has come of age as a profession. As an independent service, auditing lends credibility from the start to the finish of the report presented to the client. Credibility in today's business world is as important as ownership of the business. This is because ownership and control are sometimes separated. Financial scandals, unfortunately, have made many to ask key questions on the role of auditing processes. The researchers therefore investigated the history of auditing and the evolution of the auditing as a profession in Nigeria. As exploratory research, the study was based on desk work without any fieldwork. Documentary surveys formed the basis of the secondary data collection procedure. The study showed that the aims and roles of auditing have been changing depending on the current financial circumstances such as financial scandals, health threats, and court judgements as well as technological developments. The study pointed out that government laws and other rules and regulations in relation to internal auditing play significant duty in the development of auditing profession in Nigeria. Unfortunately, the responsiveness of internal auditing profession has been lagging in today's fast-paced businesses.

Eke et al (2023) observed that auditing, as a profession, has been in existence over the years as part of what is required by the financial law. But the nature and the mode of auditing have changed over the years as most firms have embraced the changing technological advancements. Their study was carried out to appraise the computerized auditing and how it has helped in fraud-detection and fraud control in Edo state. The study is based on two key objectives: examine the impact of digital investigation manager and CAATTs on fraud control in Edo state. The study used survey design to generate data from 384 internal auditors who responded to the questionnaires distributed. The data were analyzed using tables, percentages, and chi-squares. The study found that digital investigation manager has a positive and significant influence on auditor's role in fraud control. Again, the study found that the use of CAATTs have significantly influence the role of auditors in the present-day auditing processes. As a result of the findings, the study recommended that auditors should upskill on modern auditing software through trainings. This will enable them to perform efficiently as internal auditors in Edo state.

The Efficiency of Adopting Generalized Audit Software in Internal Auditing: A Case Study of Internal Auditors in Nigeria

3 Methodology

3.1 Research Design

This study examined the efficiency of adopting generalized audit software in internal auditing: An internal auditors' case study in Nigeria. A study design basically involves several methods used during the research process through which a conclusion is reached. The research approach for this study is a mixed method research design, which utilizes qualitative and quantitative data to arrive at a reasonable conclusion. The research design is derived from the works of Dada (2022) whose study on internal audit practices and organizational effectiveness of SMEs in Kwara state employed the mixed method as a research design.

3.2 Target Population and Sample Size Determination

The target population are all the internal auditors practicing in Nigeria. Using both purposive sampling and random sampling, an estimated 120 internal auditors were selected from the survey of twelve firms in Nigeria.

A purposive sampling technique was used to select the group of firms that currently use GAS and the group of firms that do not currently use GAS from the 12 firms. The raneasaewewdrscx4 dom sampling technique was therefore used to distribute the questionnaires among the auditors in each of these two groups. This process was deemed fit for the study as the research intends to understand if GAS impacts the efficiency of internal auditors and other key aims of the research study.

The study proposes using primary sources, comprising quantitative and qualitative data, to gather data mainly from structured questionnaires. The research study adopted a closed-ended questionnaire based on a 5-point Likert scale. The questionnaire aimed to facilitate respondents in providing answers. Further, the research study uses interviews with five senior internal auditors from each group.

3.3 Instrument of Data Collection

The respondents were given copies of the questionnaires. Again, we gave and explained the tools guiding the filling of the questionnaires to the respondents. Additionally, trained agents supervised the filling of the questionnaires and retrieval of the instruments at the spot. This helped reduce the error rate and high response rate.

Further, the instrument used 20 questions in the questionnaire. Two sections make up the questionnaire instrument. The first section covers the bio-data of the respondents, while the second section covers the variables under study. The questions are 5-likert scale questions with Strong Agree, Agree, Neutral, Disagree, and Strongly Disagree. They are weighed at 5 points, 4 points, 3 points, 2 points, and 1 point, respectively. 5 being the most positive and 1 being the most negative.

The Efficiency of Adopting Generalized Audit Software in Internal Auditing: A Case Study of Internal Auditors in Nigeria

3.4 Data Analysis Techniques

Descriptive analysis was first conducted to understand the nature of the data used (Kemp et al, 2018). This is a set of brief coefficients that represents the nature of the dataset used. In addition, the study conducted a reliability and validity test to make sure the dataset used was valid for the study's analysis. To determine the reliability of the instrument, a pilot test was conducted on the same respondents. The reliability test analysis was conducted using Cronbach Alpha to determine how reliable the dataset is.

Table 1: Descriptive Statistics

	M	SD	N
RQ1	1.76	.887	120
RQ2	1.50	.763	120
RQ3	1.98	1.156	120
RQ4	2.36	1.654	120
RQ5	2.88	1.770	120
RQ6	3.27	1.600	120
RQ7	3.26	1.390	120
RQ8	2.22	1.144	120
RQ9	2.31	1.196	120
RQ10	2.66	1.258	120
RQ11	2.60	.936	120
RQ12	2.30	.918	120
RQ13	2.16	1.013	120
RQ14	2.16	1.085	120
RQ15	2.01	.859	120
RQ16	2.15	.934	120
RQ17	2.42	.974	120
RQ18	2.31	.978	120
RQ19	2.09	.886	120
RQ20	2.22	1.032	120

3.5 Data Analysis

Principal Component Analysis (PCA) was used to analyze the data collated from the questionnaires. The choice of PCA was due to dimensionality and data exploration which makes it suitable for the primary data (Labrín & Urdinez, 2020).

4 Results

The descriptive statistics shows the nature of the dataset used in the analysis. It explains, at a glance, the data and its usefulness in the data analysis procedure. According to Efiog et al. (2018), descriptive analysis is one of the most crucial first phases of data analysis. From the data above, the standard deviation ranges between 0.76 and 1.7, indicating that the variation in their responses is not large. Again, the mean of the variables between 1 and 3 is the average response rate, which also shows that there are no issues of outliers that could have influenced the dataset for analysis.

Omonuk & Oni (2015) found a similar result in their study on computer-assisted audit technique and quality in developing countries. This supports the current study's descriptive statistics results on the dataset (cf. Table 1).

Table 2: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.810
Bartlett's Test of Sphericity	Approx. Chi-Square	3386.353
	df	110
	Sig.	.000

According to the works of Oladele and Agochukwu (2014), the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's Test of Sphericity are used to assess the suitability of the dataset for factor analysis. The result shows that KMO's are 0.8 and Bartlett's are 3386.353, indicating that the correlations are significantly different in an identity matrix and therefore suitable for factor analysis. The results also suggest that there is shared variance, which justifies the use of factor analysis (cf. Table 2).

Table 3: Component Matrix^a

	Component						
	1	2	3	4	5	6	7
RQ1	-.455	.120	.357	.494			
RQ2	-.100			.120	.182	.487	.312
RQ3	-.483	.115	.419	.284	.453	-.104	
RQ4		.815			.132		
RQ5		.838		-.124	.139		-.128
RQ6	-.117	.843		-.207			
RQ7		.655	-.188		-.236		.148
RQ8			-.116		-.381	-.656	.374
RQ9	-.210		-.668	.108		.403	-.116
RQ10						.217	.827
RQ11	.532	.126	.276	.700	-.173		
RQ12	.681			.344	-.124		
RQ13	.713		-.426		.451	-.164	
RQ14	.806		-.235	.137	.383	-.227	
RQ15	.793		-.225	.259		-.172	
RQ16	.881					.140	
RQ17	.896			-.190	-.189	.152	
RQ18	.882		.214	-.129	-.198	.132	
RQ19	.842		.319	-.216			
RQ20	.417		.384	-.450	.425		

Extraction Method: Principal Component Analysis.

a. 7 components extracted.

The component matrix shows the loadings of the individual research questions from the extracted values. The loadings show how strongly each of the questions in the questionnaire is related to a particular component. The result shows that there are strong correlations between the variables and the components, as shown in red. Component 1 has the most correlations with the variables.

Table 4: Rotated Component Matrix^a

	Component						
	1	2	3	4	5	6	7
RQ1	-.382	-.331		.571		.107	
RQ2						.351	.508
RQ3	-.620		.109	.326	.403	.209	
RQ4	-.118	.104	.811	.127			
RQ5			.855		.114		-.100
RQ6		-.145	.865				
RQ7	.110		.646		-.269	-.133	.165
RQ8	-.103					-.857	
RQ9	-.185	.102		-.209	-.715	.277	
RQ10						-.167	.840
RQ11	.404	.261		.816			
RQ12	.548	.408		.366	-.112		
RQ13	.256	.924		-.106			
RQ14	.364	.878			.135		
RQ15	.502	.684		.207		-.112	
RQ16	.802	.367		.130		.103	
RQ17	.914	.248			.112		
RQ18	.906	.199			.187		
RQ19	.832	.199			.365		
RQ20	.285	.197		-.294	.682	.179	

Extraction Method: Principal Component Analysis.
 Rotation Method: Varimax with Kaiser Normalization.
 a. Rotation converged in 15 iterations.

The research study performed a varimax rotation on the extracted components as it helps to simplify the interpretation of the components through the maximization of the variance through squared loadings within each component (Richman, 1986). This makes it easier to identify the RQs that have any form of relationship with the components.

The components of the analysis are subjectively defined based on the re-occurring themes in the analysis. To the research questions, the seven components are represented as follows:

- 1 Efficiency in GAS usage
- 2 GAS is Time saving
- 3 Challenging in GAS integration
- 4 Training and skill development
- 5 Better skill development through GAS usage
- 6 Collaboration and Communication
- 7 Increased Stakeholder confidence

5 Summary and Discussion

The analysis above has shown that the seven components identified have some varying forms of relationship with the questions on the questionnaire. The results of the analysis are interpreted using the rotated component matrix.

Does the implementation of GAS have any impact on the efficiency of internal auditors' practices in Nigeria?

The analysis shows that there is a strong relationship between the efficiency because of the adoption of GAS (RQ1) and the training and skill development of the auditors (component 4) at 0.571. This indicates that as the training and skill development of the auditors improve in the use of GAS, their efficiency also improves, and vice versa.

In addition, the study also showed that the ability of the auditors to conduct their functions more effectively (RQ2) has a strong relationship with increased stakeholder confidence. As the result shows, the strength of the relationship is 0.508. This indicates that as auditors' abilities increase, stakeholders become more confident in their work, and vice versa.

The analysis also shows that component 3 has a strong and positive relationship with RQ4 and RQ5, at 0.811 and 0.855, respectively, indicating that challenges in GAS implementation positively affect the time-saving and improved accuracy of the audit procedures in Nigeria.

We conclude that there is a significant relationship between the implementation of GAS and the efficiency of internal auditors' practices in Nigeria, as revealed by the research.

Are there challenges and barriers encountered by internal auditors in the process of adopting and integrating GAS as part of their auditing process?

The analysis reveals that RQ6 and RQ7 have a strong and positive relationship with component 3. The result reveals that the difficulty of the adoption of GAS and resource constraints are part of the key challenges in the integration of GAS in the auditing firms examined. As the result shows, the

The Efficiency of Adopting Generalized Audit Software in Internal Auditing: A Case Study of Internal Auditors in Nigeria

strengths of the relationships are 0.865 and 0.646, respectively, for RQ6 and RQ7.

The results indicate a negative relationship between RQ8 and component 6. This implies that as resource constraints increase, there are fewer collaborations and communications by the users of GAS in the organization, and vice versa. This makes it difficult for auditors to communicate less with others due to poor resources to acquire sophisticated communication gadgets that would have ensured a smoother communication process when using GAS.

Also, the RQ9 has a negative but strong relationship with component 5. As the data shows, the provision of support and training by the firms has not significantly improved skill development using GAS. It implies that the support and training programs of the auditing firms have not achieved the desired results as they do not lead to the needed skills through GAS usage over time.

Further, the result shows that RQ10 has a positive and significant correlation with component 7—increased stakeholder confidence. As the result shows, a high degree of resistance from staff to the adoption of GAS is related to an increased stakeholder's confidence level in the auditing firms, and vice versa. This is not expected, however.

The analysis has shown that there are challenges in the adoption and usage of GAS by the auditors. Key challenges identified by the study include resource constraints, support and training of the auditors in the usage of GAS, and poor communication or collaboration among the users of GAS and the non-users. These can be amended by ensuring that the challenges identified are fixed., making the adoption of GAS easier in Nigeria.

What are the key success metrics and best practices in the usage of GAS by internal auditors as part of their auditing process?

From the analysis above, the result shows that the key success metrics center around two components: 1 and 2. This clearly shows that the success metrics of adopting GAS in Nigeria are based on the efficiency of GAS usage and the time-saving advantage GAS has over manual methods of auditing.

As the result shows, RQ12 and RQ15 have a positive and significant correlation with efficiency in GAS usage at 0.548 and 0.502, respectively. This implies that clear audit objectives and goals must be established when adopting GAS in Nigeria if efficiency of the GAS is to be achieved. This helps to measure the success or failure of its adoption and usage.

Again, the result of the analysis shows that RQ13, RQ14, and RQ15 have a strong correlation with component 2 at 0.924, 0.878, and 0.684, respectively. This shows how timesaving is an important success metric in the adoption of GAS in Nigeria. The result reveals that regulatory reviews and updates by auditors, effective communication and collaboration, and regular evaluation and assessment of GAS usage play key roles in measuring the success of GAS adoption in Nigeria.

Does the efficiency gained through the adoption of GAS translate into better audit quality and value addition as part of internal auditing?

The analysis reveals that RQ16, RQ17, RQ18, and RQ19 have a strong and positive correlation with component 1, while RQ20 has a strong correlation with component 2 at 0.802, 0.914, 0.906, and 0.832. Therefore, it is revealed that the impact of GAS has improved the overall quality of audit report products, enhanced the ability to identify and mitigate risks, and increased efficiency through the adoption of GAS. We note that the adoption of GAS in Nigeria—making it compulsory—will improve the quality of the audit work and identify and mitigate risks such as fraud, etc.

The findings of the study agree with the findings of Adebayo & Olugbemga (2012), Widuri & Yapa (2016), and Normahazan et al. (2020), who also found in their various studies that factors such as individual expectations, communication and collaboration, timesaving, and accuracy of GAS implementation were some of the factors that led to the adoption of GAS in auditing firms.

6 Conclusion

GAS adoption and usage in Nigeria is an important goal to be pursued by the auditors in Nigeria if the gains associated with its adoption are to be enjoyed by the auditors and the stakeholders. The study critically examined the efficiency of adopting GAS in internal auditing by focusing on internal auditors in Nigeria. Critical research questions were formulated to guide the study. Data were generated from questionnaires. The Principal Component Analysis (PCA) was used for the data analysis.

The findings show that:

- factors such as communication, collaboration, training and skill development, resource constraints affect the adoption and implementation of GAS in Nigeria over the years.
- The study also found that adopting GAS can result in more efficiency in the audit work, save more time, and increase the efficiency of the auditors as they work with GAS over time.

Therefore, it is recommended that:

- for the adoption of GAS to be successful in Nigeria, there must be clear objectives and goals of what is expected.
- It is also recommended that there should be increased communication and collaboration among users and non-users in Nigeria. This will help to deepen the adoption and usage of GAS in Nigeria.

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