The Impact of Digital Technologies on the Effectiveness of Internal Audit Function in Commercial Banks in Kenya.

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ABSTRACT

This study is set out with the general objective of establishing the effect of digital technologies on the effectiveness of internal audit function in commercial banks in Kenya. The research is guided by the following specific objectives; to determine the effect of artificial intelligence on the effectiveness of internal audit function in commercial banks in Kenya; to determine the effect of cognitive technology on the effectiveness of internal audit function in commercial banks in Kenya; to determine the effect of data analytics on the effectiveness of internal audit function in commercial banks in Kenya; to assess the effect of robotic process automation on the effectiveness of internal audit function in commercial banks in Kenya; to determine the joint effect of digital technologies (artificial intelligence, cognitive technology, data analytics and robotic process automation) on the effectiveness of internal audit function in commercial banks in Kenya. The research employed descriptive research design. The target population for the study was all the 39 licensed commercial banks in Kenya. A census of the population was used in this study. Primary data was collected using closed questionnaires. Descriptive and inference statistics were used to analyze the data with the help of Statistical Package for Social Sciences (SPSS) Version 23 programme. Pearson correlation was used to establish the strength of the independent variable on the dependent variable. Regression (Simple and multiple) analysis was used to establish the effect of the independent variable on dependent variable. The data analyzed was presented in the form of tables, pie charts and graphs. The study examined the effect of digital technologies artificial intelligence (AI), cognitive technology, data analytics, and robotic process automation (RPA) on the effectiveness of the internal audit function in commercial banks in Kenya. The findings indicated that AI and RPA had a positive and significant impact on internal audit effectiveness, whereas cognitive technology and data analytics did not have a statistically significant effect. However, when analyzed jointly, all digital technologies had a significant and positive joint effect on internal audit effectiveness. Develop comprehensive digital transformation strategies: Banks should take a holistic approach in implementing digital technologies to maximize their combined impact on the internal audit function. Regulators should develop policies that guide the ethical and effective use of AI and RPA in internal audit functions. The government and regulatory bodies should incentivize banks to integrate digital technologies to improve transparency and efficiency in auditing.

Keywords: Digital Technologies, Internal Audit Function, Commercial Banks

INTRODUCTION

Over the past few decades, there has been a great transformation in the banking industry worldwide caused by increasing globalization and deregulation (Lawrence, 2010). Technological developments such as the use of Automatic Teller Machines (ATMs) mobile phone banking, internet banking, cloud computing, Robotic Process Automation and smartcard applications are taking place at an overwhelmingly fast pace. Norton (1995) asserts massive, quick, innovative developments are supplanting the conventional department teller. With greater competition brought by deregulation, globalization and widespread mergers and acquisitions taking place in the banking sector, more branches are being closed and replaced by self-service banking (SSB) offices like the ATMs as a portion of a bigger rationalization exercise.

Gardeva and Rhyne (2011), defines technological financial innovations as the process through which

Financial institutions harness the capabilities of Information and Communication Technology (ICT) in establishing new products and services and new ways of rendering banking services. Jack and Suri (2010) notes that financial innovations in the banking sector aim at enhancing service delivery thereby enlarging the market share of specific financial institutions. According to Lawrence (2010), innovations seek to establish more efficient systems than the previous systems. It implies that advancements are only advantageous if they lead to cost savings, diminishment of time for carrying out exercises, improved benefit conveyance, progressed stakeholders' relations and improved access to products and services.

Most of the rising advances have critical effects in the monetary administrations industry e.g., the adoption of Robotic Process Automation (RPA). IBS Intelligence (2019)'s report acknowledged that the RPA technology deploys software robots to automate repetitive, rule based, and high-volume tasks, has helped financial institutions in the phase of digital transformation. The centrality of RPA is that it is persistently advancing like any other innovation and is presently increasing with the potential of Artificial Intelligence technology giving rise to what is known as Cognitive Automation (IBS Intelligence, 2019).

The essential objective of investigating and building RPA capabilities is to handle expansive sums of dreary and monotonous errands with constrained assets so that banks all altogether diminish processing time and blunders, which thus leads to expanded exactness and unwavering quality (Romão, Costa & Costa, 2019).

Even with increased adoption of digital technologies in companies, these emerging digital technologies are disrupting and transforming enterprises in all sectors and at all levels. This combination of technological and market innovation is fundamentally different from previous industry transformations, as members of the EACLN and the North American Audit Committee Leadership Network (ACLN) discussed at the Audit Committee Leadership Summit in Zurich, highlighting the speed and scale of transformation, the interaction of technologies resulting in "combinatorial innovation," and changing customer expectations and relationships. Companies are harnessing new technologies– mobile and cloud computing, the internet of things, automation and artificial intelligence – to replace legacy systems with digital platforms and interact with customers and suppliers in new ways, in some cases even changing the fundamental nature of their business (Waltham, MA: Tapestry Networks, 2016).

Statement of the Problem

New digital technologies are transforming many aspects of business, including the internal audit function. These digital technologies allow internal audits to be more effective as advanced analytics and automation are enabling greater coverage, efficiency, and insight into business processes. As these technologies enable innovative digital platforms and new business models, they are presenting fresh challenges for internal audit function and its oversight of the control environment and risk management. The implementation challenges are significant, including a pressing need for expertise and the need to ensure that internal audit remains independent.

With the adoption of digital technologies, there is a high risk of erosion of ethics. Additionally, complexity of digital technologies poses a risk of information processing and cognitive limitations (e.g., information overload) to auditors when analyzing and interpreting output from data analytic tools. Lastly, the issue of data security arises as the banks adopt new technologies hence securing the data from cybercrimes is a great challenge that internal audit function needs to put more focus on. Various studies conducted on this topic do not clearly address these gaps. For instance, the place of ethics within digital technologies on audit quality, cyber security issues relating to the safety of critical audit data and independent professional judgement of the auditors in relation to application of digital technologies remain a hurdle. This study therefore seeks to address the issues arising from the deployment of digital technologies and their impact on the effectiveness of the internal audit function in commercial banks in Kenya.

Objectives of the Study

To assess the effect of digital technologies on the effectiveness of internal audit function in commercial banks in Kenya.

LITERATURE REVIEW

The Comfort Theory

This theory was developed by Katherine Kolcaba in 1990. Kolcaba's theory of comfort explains as a fundamental need of all human beings for relief, ease or transcendence arising from health care situations that are stressful. The major concept within Katherine Kolcaba's theory is comfort. The conceptual assertion of this theory is the reduction of harmful tension that may be presented by various factors as outlined which may limit the effectiveness and efficiency in the nursing practice. The theory holds that when nursing interventions are effective, the outcome of enhanced comfort is attained.

Pentland (1993) contends that auditing is a process for making consolation where the primary objective of the audit itself is to change the financial statements from a deceitful state into something that the evaluators and society can feel comfortable with. This theory is relevant to this study as one of the main areas of auditors is to provide comfort not only to themselves but also to the users of the financial statements. Internal auditors' unique knowledge about risk management and internal control, combined with appropriate interpersonal and behavioral skills, enables them to provide this comfort. Comfort theory extends its importance in this study by providing insights and an understanding of how a level of comfort relates to professional judgement, which in turn affects the audit quality. Further, this theory provides an understanding on whether implementation of digital technologies within internal auditing makes auditors more comfortable in their work and the extent to which professional skepticism is applied regarding digital technologies.

Theory of Inspired Confidence

This theory was introduced in 1920s by Theodore Limperge; a Dutch professor. This theory asserts that the demand and supply of audit services are driven by the participation of external stakeholders who steer the affairs of organizations. Partners who deliver assets to guarantee the organization's presence and survival demand responsibility from those in charge of the organization's day-to-day operations. The theory suggests that the information should be exposed to independent scrutiny and during such an independent assessment, the auditor should make use of all resources at his disposal to guarantee that stakeholders' expectations are satisfied by providing an expected degree of assurance (Mathias & Kwasira, 2019).

As stated by Mathias and Kwasira (2019), the timely provision of information enhances the quality of audits and the use of digital applications in the auditing process saves time and enables accurate collection of data. Additionally, digitalization in the auditing process improves the auditors' speed to handle and oversee gigantic sums of information in real-time and allows auditors to give noteworthy data to partners and easily detect irregularities in the financial statements.

Technology Acceptance Model

Developed by Davis (1989), the Technology Acceptance Model (TAM) theory assumes that when users perceive that a type of technology is useful and easy to use, they will be willing to use it. Dillon & Morris (1996) notes that the more employees recognize that the systems will make their tasks easier to perform; the higher the probability that they will use it and accept the new technology as being useful. Kim et al., 2009; Thompson et al., 1991; Adams et al., (1992), argues that system usage is the primary indicator of technology acceptance which is measured in terms of frequency and time. Behavioral intention is a factor that leads people to use technology. The behavioral intention (BI) is influenced by attitude (A) which is the general impression of technology.

The TAM model suggests two factors on which the decision to use the system is based: Perceived usefulness (PU): that someone perceives that technology will be useful for what they want to do and Perceived Ease of Use (PEOU) Perceived ease-of-use (PEOU): that using a particular system would be free from effort. Complicated and complex systems prove user unfriendly hence negative reaction towards it. Accordingly, the more users find the application will make their job easier to perform; the higher the probability that the technology will be accepted. The TAM model is of much relevance to this study as it will help in establishing whether the internal audit functions within commercial banks view digital technologies as a barrier to the tasks

performed or as an enabler.

Empirical Review

Artificial Intelligence and Effectiveness of Internal Audit Function

Munoko, (2020) aimed to investigate the ethical implications of using artificial intelligence in auditing. The researcher noted that accounting firms report the use of artificial intelligence (AI) in their audit and consulting functions, citing benefits such as time savings, faster data analysis, increased levels of accuracy, deeper insight into business processes and improved customer service. The study concluded that all the Big Four companies report on their use and plans to continue this innovation in areas such as audit planning, risk assessments, transaction testing, analysis and verification work, among other uses. The researcher recommended that many researchers explore not only the benefits of AI, but also the ethical implications of using this emerging technology. By combining two futuristic ethical frameworks, we foresee the ethical implications of using AI in auditing, given its inherent characteristics, nature, and intended functions.

Luo et al., (2018) examined the Impact of Artificial Intelligence Application on the Development of Accounting Industry with the rapid development of information technology and the needs of business society, artificial intelligence has ushered in the golden age. The study found that artificial intelligence is moving from technology research and development to industrial application and has become a new driving force for global economic development. The accounting industry should also strengthen the main position of artificial intelligence application in the process of reform and innovation. For enterprises, making good use of new information technology will be the key to capturing opportunities and upgrading in the new era.

Study of Puthukulam, G., et al, (2021) aimed to determine Auditors' Perception on the Impact of Artificial Intelligence on Professional Skepticism and Judgment in Oman Technology as an unavoidable part of business and human lives. The study considered several factors influencing AI and ML usage and challenges. The study found that AI and ML assisted audit practices have a strong positive relationship with professional skepticism and professional judgment. The study found that Audit efficiency is related to the professional skepticism and professional judgment demonstrated by the auditors. In addition, it helps to improve the detection of errors and material inaccuracies. The study recommended that the audit must be carried out with the help of AI and ML, along with human intervention to improve the efficiency of the audit.

Study of Fedyk, (2021) aimed to examine the impact of artificial intelligence (AI) on audit quality and efficiency. The study explored this question by leveraging a unique dataset of more than 310,000 detailed individual resumes for the 36 largest audit firms to identify audit firms' employment of AI workers. The study examined the AI workforce within the auditing sector. The results indicated that AI workers tend to be male, relatively young, and hold mostly but not exclusively technical degrees. The study concluded that AI is a centralized function within the firm, with workers concentrating on a handful of teams and geographic locations. The results further showed that investing in AI helps improve audit quality, reduces fees, and ultimately displaces human auditors, although the effect on labor takes several years to materialize.

Robotic Process Automation and Effectiveness of Internal Audit Function

Hosadurga, (2017); Kumar, (2020) conducted a study on the impact of RPA adoption in the South Korean retail banking industry in relation to work productivity through a quantitative analysis. Specifically, the study took the attributes from the IT innovation theories to observe the front office bank employees' behavior with the adoption of a new technology like RPA. Data sources included analysis of financial reports of the major banks in South Korea and business journals. The research found that the usage rate of RPA bots is relatively low but as the usage ratio increases, the more likely that the results will become favorable. Thus, installation of a sound system that works properly will be the top priority but training and follow-up management for users are equally important so that the RPA system can be utilized.

Aguirre and Rodriguez, (2017) conducted a study on Automation of a Business Process using Robotic Process Automation (RPA): A Case Study of BPO provider firm located in Bogotá, Colombia. The research revealed

that most of the RPA applications were carried out on back-office business process where the customer is not directly involved, therefore a case study was conducted on a BPO provider to verify the benefits and results of applying RPA to a service business process with front and back-office activities. The research model was tested using a survey questionnaire. The results showed that the automation of tasks reduces costs and execution time, increases productivity and accuracy, mitigates or eliminates human errors. The results further showed that productivity improvement is the main benefit of RPA, nevertheless time reduction was not achieved in this case.

Papa (2022) conducted a study on the impact of barriers and benefits on adoption readiness of RPA in Kenyan commercial banks. The main objective of the study was to investigate the adoption of Robotic Process Automation in Kenyan Commercial Banks. This study employed descriptive research among a population of 41 commercial banks. Both descriptive and inferential statistics were computed in data analysis process. With a unit advancement in perceived benefits, the study found that the resulting effect on RPA adoption is a positive factor of 0.507 which according to the findings, was statistically significant (α=0.000). When commercial banks get to know that if implemented correctly RPA can very quickly bring greater efficiency to business processes, there will be enhanced implementation process due to perceived benefits. Based on the relation between barriers and the adoption of Robotic Process Automation in Kenyan Commercial Banks, the study established that every single unit of technology barrier reduces RPA implementation by 0.072 units although according to the findings, its effect is insignificant (α=0.068).

Data Analytics and Effectiveness of Internal Audit Function

Kaya, Akbulut, Ozoner, (2018) conducted a study on big data analytics in internal audits. The aim of the study was to analyze the role and effects of big data analytics (BDA) on internal audit. To achieve this aim, the researchers conducted a focus group study on the BDA and its impact on internal audit. The research adopted an exploratory research design based on a focus group to generate knowledge from different perspectives. The study found that big data analytics increase the effectiveness of internal audit. Using analytics in internal control, risk management and fraud detection have many benefits in identifying anomalies and exceptions and focusing more on correlation and causation.

A study of Tang, Norman, and Vendrzyk (2017) on Exploring perceptions of data analytics in the internal audit function was conducted with an aim of understanding the use of data analytics within the internal audit function (IAF) and to investigate the types of tools internal auditors use, given the large amounts of data available to them for analytic purposes. The study adopted a case study approach. The intention was to gather descriptive information with respect to the IAF, as well as quantifiable responses to specific questions about the role of data analytics in each CAE's IAF. The findings indicated that CAEs value professional certifications and the use of data analytics in the IAF. The results of the study showed that the demand for data analytics will continue to increase and within five years, enterprises' internal audit departments will need additional employees who know data analytics technologies. The findings also underlined that this change would affect many universities' schedules and programmes.

Li, *Dai*, *Gershberg*, & *Vasarhelyi* (2018) conducted research on understanding usage and value of audit analytics for internal auditors: An organizational approach. The study adopted the Technology-Organization-Environment framework "TOE framework" (Tornatzky et al., 1990) to examine the determinants and extent of audit analytics usage, as well as whether using audit analytics improves the performance of the internal audit function. The hypothesis test results suggested that IT complexity has no impact on application-level audit analytics usage.

Cognitive Technologies and Effectiveness of Internal Audit Function

Dunja Dobrinić (2019) examined the impact of cognitive technologies on selecting and processing samples in financial statements audit. The aim of the research was to investigate attitudes of auditors on the territory of the Republic of Croatia on the application of new technologies in the audit process. To prove the hypotheses, research was carried out among authorized auditors and audit assistants in the Republic of Croatia. Descriptive and inferential statistics and bivariate statistical methods (ANOVA and correlation analysis - Pearson correlation) were used. According to the results of the research between attitudes on sample size and attitudes on the introduction of new technologies, there was a positive correlation link. The research showed that only

18% of auditors and audit assistants encompassed in the research were familiar with the term cognitive technology as a branch of artificial intelligence, while 41.80% believed smart computers can help form auditor's opinion.

A study by Oluoch (2022) examined the effects of information technology on internal auditing in Kenyan commercial banks. The research found that the use of technologies such as blockchain, cybersecurity measures, big data, and data analytics significantly improved the efficiency, transparency, and accuracy of auditing processes. These technologies, which fall under the umbrella of cognitive technologies, have been instrumental in strengthening audit integrity and reducing the cost and time associated with internal audit processes. Research indicates that strategic technological innovations, which include cognitive technologies, have a positive and significant effect on the performance of commercial banks in Kenya. These innovations enhance various aspects of banking operations, including internal audit functions, by introducing more efficient and effective processes.

RESEARCH METHODOLOGY

This study used descriptive research design. This method depicts the state of affairs as it exists and the researcher can only report on what has happened or is happening (Creswell, 2014). It provides a comprehensive picture of the characteristics and behaviors of a particular population or phenomenon, allowing the researcher to gain a deeper understanding of the topic. The target population for this study was all commercial banks in Kenya. According to the Commercial Bank of Kenya (CBK, 2023), Kenya has a total of 39 licensed Commercial banks (20 local private banks, 17 foreign local banks and 2 local public banks). The respondents were the heads of department of the internal audit function from each commercial bank.

A sample is a segment of the population selected to represent the population as a whole Kothari (2004). According to the Commercial Bank of Kenya list 2023 (CBK, 2023) Kenya has a total of 39 licensed commercial banks. Owing to the small number of CBK registered commercial banks the study adopted a census survey by focusing on all the 39 commercial banks. The heads of internal audit departments were the respondents from each bank.

In this study, primary data was collected using closed ended questionnaires as the main data collection instrument. Closed questionnaires provide more structured responses. For better administration, the researcher used the drop and pick method. A five point Likert scale, ranging from strongly agree to strongly disagree was used to measure the importance the respondents attached to the independent variables (Brace, 2012). The questionnaires have six sections A- F. A related to demographic data while B-F was used to collect data on the study variables. The questionnaires solicited ideas related to the research problem from respondents addressing the research objectives.

Data collected using questionnaires was edified for completeness and consistency. As recommended by (In, 2017), the data collected should be sorted and coded to ensure that the responses are grouped according to the objectives. The coded data was analyzed with the aid of SPSS (Version 23) software. The result obtained from the SPSS was grouped according to the various themes or variables. Data was analyzed by using descriptive and inferential statistics. Pearson correlation was used to establish the strength of the independent variable on the dependent variable. Regression (Simple and multiple) analysis was used to establish the effect of the independent variable on dependent variable. The objective was represented by the multiple regression indicated below:

$$\mathbf{Y= \beta_0+ \beta_1X_1+\beta_2X_2+ \beta_3X_3+ \beta_4X_4+ \varepsilon \ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.5}$$

Where Y = Prevention of Material Misstatement

β_0 = Constant

$\beta_1, \beta_2, \beta_3, \beta_4,$ = Variable Coefficients

X_1 = Artificial Intelligence

X_2 = Cognitive Technology

X_3 = Data Analytics

X_4 = Robotic Process Automation

ε = Error term

FINDINGS AND DISCUSSIONS

Correlation Analysis

This study sought to establish the effect of digital technologies on the effectiveness of internal audit function in commercial banks in Kenya. It was important to establish the nature of the correlation between Digital Technologies and Internal Audit Function among the commercial banks. The results of the analysis were presented as below.

		Internal Audit Function	Artificial Intelligence	Cognitive Technology	Data Analytics	Robotic Process Automation
Internal Audit Function	Pearson Correlation	1	.914**	.514**	.250	.245
	Sig. (2-tailed)		.000	.002	.148	.155
	N	35	35	35	35	35
Artificial Intelligence	Pearson Correlation	.914**	1	.551**	.290	.039
	Sig. (2-tailed)	.000		.001	.091	.826
	N	35	35	35	35	35
Cognitive Technology	Pearson Correlation	.514**	.551**	1	.608**	.130
	Sig. (2-tailed)	.002	.001		.000	.456
	N	35	35	35	35	35
Data Analytics	Pearson Correlation	.250	.290	.608**	1	.149
	Sig. (2-tailed)	.148	.091	.000		.393
	N	35	35	35	35	35
Robotic Process Automation	Pearson Correlation	.245	.039	.130	.149	1
	Sig. (2-tailed)	.155	.826	.456	.393	
	N	35	35	35	35	35
**. Correlation is significant at the 0.01 level (2-tailed).						

Correlation only indicates the existence or nonexistence of a correlation, rather that providing insight on the relationship. Artificial intelligence and internal audit function had a person correlation of 0.914 which depicts artificial intelligence have positive impact on internal audit functions. Cognitive Technology positively influences the internal audit function as shown by correlation of 0.514, Data analytic positively influences the internal audit function as shown by correlation value of 0.245. Robotic process automation has a positive relation

with internal audit function as shown by value of 0.245. The study shows limited correlation between the independent and the dependent variables. The findings are summarized in table 4.8

The existing literature by Ajayi, and Akinrinola (2023) did a study on the Artificial Intelligence & Internal Audit Quality of Commercial Banks in Nigeria. The study found out the AI enhances internal audit quality in Nigerian commercial banks by improving real-time detection, audit coverage, accuracy, and efficiency. Merkhoufi, and Sadani, (2024) did a study on the Impact of Artificial Intelligence on Internal Audit Quality Amidst the Challenges of Algeria's IT Infrastructure. Findings: AI significantly improves audit quality in Algerian organizations, especially when supported by robust IT infrastructure. Adhim and Mohammed (2024) did a study on the Utilizing Robotic Process Automation and Artificial Intelligence in Auditing to Mitigate Audit Risks. The study found out the integration of AI and RPA in auditing enhances the reliability of financial statements and mitigates inherent control and detection risks. Islam and Stafford, (2022) did a study on the factors Associated with the Adoption of Data Analytics by Internal Audit Function. Findings: The adoption of data analytics in internal audit functions is influenced by data-specific IT knowledge and critical thinking skills. Poncin, (2024) did a study on the Impacts of the Use of Data Analytics and the Performance of Consulting Activities on Perceived Internal Audit Quality. The use of data analytics by internal auditors leads to higher perceived competence and relevance of audit recommendations among managers.

Regression Analysis Results

This research employed the Changed R-Square to demonstrate the robustness of the regression model against attacks; this is on the grounds that it possibly increases assuming the new term added enhances the model by being pertinent to the analysis and decreases when the added predictor does not contribute relevance to the study. The study employed both simple and multiple regression model to assess the joint effect of digital technologies (artificial intelligence, cognitive technology, data analytics and robotic process automation) on the effectiveness of internal audit function in commercial banks in Kenya.

Simple Regression Analysis

The Effect of Artificial Intelligence on the Effectiveness of Internal Audit Function in Commercial Banks in Kenya.

The table below shows the regression model that was used to summarize the results as shown below.

Table 4.9 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.914[a]	.836	.831	.40253
a. Predictors: (Constant), Artificial Intelligence				

The study results presented on table 4.9 indicate that R squared was 0.836 and that the total variation 83.6 % in effectiveness of internal audit function can be attributed to by artificial intelligence. This suggests that other factors, not part of the study scope, contributed 16.4%. The research discovered a strong correlation between the artificial intelligence and internal audit functions as indicated by 0.914 as the coefficient of correlation (R) value, lying above the threshold value of 0.5.

Table 4.10 ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	27.183	1	27.183	167.765	.000[b]
	Residual	5.347	33	.162		

	Total	32.529	34			
a. Dependent Variable: Internal Audit Function						
b. Predictors: (Constant), Artificial Intelligence						

Table 4.11 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	.742	.260		2.854	.007
	Artificial Intelligence	.790	.061	.914	12.952	.000
a. Dependent Variable: Internal Audit Function						

The Effect of Cognitive Technology on the Effectiveness of Internal Audit Function in Commercial Banks in Kenya

The table below shows the regression model that was used to summarize the results as shown below.

Table 4.12 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.514[a]	.264	.242	.85151
a. Predictors: (Constant), Cognitive Technology				

The study results presented on table 4.12 indicate that R squared was 0.264 and that the total variation 26.4 % in effectiveness of internal audit function can be attributed to by cognitive technology. This suggests that other factors not part of the study scope contributed 73.6%. The research discovered a strong correlation between the cognitive technology and internal audit functions as indicated by 0.514 as the coefficient of correlation (R) value, lying above the threshold value of 0.5.

Table 4.13 ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.602	1	8.602	11.864	.002[b]
	Residual	23.927	33	.725		
	Total	32.529	34			
a. Dependent Variable: Internal Audit Function						
b. Predictors: (Constant), Cognitive Technology						

Table 4.14 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	1.029	.872		1.180	.247

Cognitive Technology	.776	.225	.514	3.444	.002
a. Dependent Variable: Internal Audit Function					

The Effect of Data Analytics on the Effectiveness of Internal Audit Function in Commercial Banks in Kenya

The table below shows the regression model that was used to summarize the results as shown below.

Table 4.15 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.250[a]	.062	.034	.96138
a. Predictors: (Constant), Data Analytics				

The study results presented on table 4.15 indicate that R squared was 0.062 and that the total variation 6.2 % in effectiveness of internal audit function can be attributed to by data analytics. This suggests that other factors not part of the study scope contributed 93.8%. The research discovered a weak correlation between the data analytics and internal audit functions as indicated by 0.250 as the coefficient of correlation (R) value, lying below the threshold value of 0.5.

Table 4.16 ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.029	1	2.029	2.195	.148[b]
	Residual	30.500	33	.924		
	Total	32.529	34			
a. Dependent Variable: Internal Audit Function						
b. Predictors: (Constant), Data Analytics						

Table 4.17 Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2.908	.750		3.878	.000
Data Analytics	.302	.204	.250	1.482	.148
a. Dependent Variable: Internal Audit Function					

The Effect of Robotic Process Automation on the Effectiveness of Internal Audit Function in Commercial Banks in Kenya

The table below shows the regression model that was used to summarize the results as shown below.

Table 4.18 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.245[a]	.060	.032	.96250
a. Predictors: (Constant), Robotic Process Automation				

The study results presented on table 4.18 indicate that R squared was 0.060 and that the total variation of 6.0 % in effectiveness of internal audit function can be attributed to by robotic process automation. This suggests that other factors not part of the study scope contributed 94%. The research discovered a weak correlation between the robotic process automation and internal audit functions as indicated by 0.245 as the coefficient of correlation (R) value, lying below the threshold value of 0.5.

Table 4.19 ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.958	1	1.958	2.114	.155[b]
	Residual	30.571	33	.926		
	Total	32.529	34			
a. Dependent Variable: Internal Audit Function						
b. Predictors: (Constant), Robotic Process Automation						

Table 4.20 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	3.197	.571		5.598	.000
	Robotic Process Automation	.250	.172	.245	1.454	.155
a. Dependent Variable: Internal Audit Function						

Multiple Regression Model

The study employed multiple regression model to assess the joint effect of digital technologies (artificial intelligence, cognitive technology, data analytics and robotic process automation) on the effectiveness of internal audit function in commercial banks in Kenya.

Table 4.21 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.939[a]	.882	.866	.35742
a. Predictors: (Constant), Robotic Process Automation, Artificial Intelligence, Data Analytics, Cognitive Technology				

Table 4.21 shows the model fitness output and R squared value as 0.882 as revealed by the model summary. This indicates that the variables (Robotic Process Automation, Artificial Intelligence, Data Analytics, Cognitive

Technology) account for 88.2% of the variation of internal audit function at a confidence level of 95%. Hence, it is inferred that other factors outside the scope of study account for 11.8%. The existing variables relationship is reflected by the correlation coefficient R. The correlation coefficient R value from the study was 0.939 which indicates that the research variables had a considerable positive relationship.

Table 4.22 ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	28.697	4	7.174	56.158	.000[b]
	Residual	3.833	30	.128		
	Total	32.529	34			
a. Dependent Variable: Internal Audit Function						
b. Predictors: (Constant), Robotic Process Automation, Artificial Intelligence, Data Analytics, Cognitive Technology						

The F value was 56.158 as determined by ANOVA (Analysis of Variance) analysis and is statistically significant at 0.000 which is less than the standard 0.05 threshold value as seen on table 4.25. The probability of the model was lower than 0.05 leading to incorrect predictions while the variables showed a direct correlation. The results according to the current study indicates that independent variables (Robotic Process Automation, Artificial Intelligence, Data Analytics, Cognitive Technology) did not indicate statistical significance in predicting the internal audit functions at a significance level of 95%.

From table 4.22 the showed study results the (p=0.000) at 95% confidence level indicated that artificial intelligence, cognitive technologies, data analytics and robotic process automation had a positive and significant effect on the effectiveness of internal audit function in commercial banks in Kenya. The study rejected the null hypothesis that there is no significant combined effect of artificial intelligence, cognitive technologies, data analytics and robotic process automation on the effectiveness of internal audit function in commercial banks in Kenya since the P value of 0.000 is less than 5% level of significance.

Table 4.23 Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.191	.404		.472	.640
Artificial Intelligence	.788	.065	.912	12.113	.000
Cognitive Technology	.029	.137	.019	.209	.836
Data Analytics	-.070	.096	-.058	-.734	.469
Robotic Process Automation	.220	.065	.216	3.408	.002
a. Dependent Variable: Internal Audit Function					

Through the assessment of coefficients or beta values of each of the study variables, the research was able to determine each independent variables significance in the study. The variables relationship was guided by the beta values. A positive relationship was signified by a positive sign while a negative relationship was signified by a negative sign. The current study provided the multiple regression equations with both unstandardized and standardized coefficients. Nevertheless, analysis and interpretation are focused on the unstandardized coefficients:

$$Y = 0.191 + 0.788X1 + 0.029X2 - 0.070X3 + 0.220X4$$

The given regression equation indicates that independent variables such as Robotic Process Automation, Artificial Intelligence, Data Analytics, Cognitive Technology) have been found to be constant internal audit function will be 0.191. artificial intelligence had a positive coefficient of 0.788, Cognitive technology had a positive beta coefficient of 0.029, data analytic had a negative coefficient of 0.070, and robotic process automation had a positive coefficient of 0.220.

CONCLUSION

The study established that AI had a significant effect on the effectiveness of internal audit functions (β = -0.788, p = 0.000). This finding suggests that the integration of AI tools, such as machine learning and intelligent automation, enhances audit accuracy, risk assessment, and fraud detection capabilities. As a result, the null hypothesis was rejected, confirming that AI contributes meaningfully to the internal audit process. The findings indicated that AI and RPA had a positive and significant impact on internal audit effectiveness, whereas cognitive technology and data analytics did not have a statistically significant effect. However, when analyzed jointly, all digital technologies had a significant and positive combined effect on internal audit effectiveness.

The analysis revealed that cognitive technologies had a positive but statistically insignificant effect on internal audit effectiveness (β = 0.029, p = 0.836). This indicates that while cognitive technologies (e.g., natural language processing or computer vision) may offer some potential value, their current adoption or integration in Kenyan banks does not significantly influence internal auditing outcomes. Therefore, the null hypothesis was retained.

The study showed an insignificant effect of data analytics on internal audit effectiveness (β = 0.070, p = 0.49). This suggests that despite the availability of big data tools, their practical impact on audit quality, timeliness, and scope remains limited, possibly due to skill gaps, underutilization, or infrastructural challenges. As such, the null hypothesis was not rejected.

Findings indicated that RPA had a significant effect on internal audit effectiveness (β = -0.220, p = 0.002). This reflects RPA's role in automating repetitive audit tasks, improving speed, consistency, and reducing human error. Consequently, the null hypothesis was rejected, supporting the conclusion that RPA enhances audit function efficiency in Kenyan banks.

The study concludes that artificial intelligence and robotic process automation significantly enhance the effectiveness of internal audit functions in commercial banks in Kenya. In contrast, cognitive technologies and data analytics, while potentially beneficial, currently do not have a statistically significant impact. This calls for more strategic investment, capacity-building, and integration efforts, especially around cognitive tools and data analytics, to fully realize their potential in audit transformation.

RECOMMENDATIONS.

This study recommends that the Central Bank of Kenya (CBK), in collaboration with other financial regulators, develops clear guidelines for responsible AI adoption in internal audit processes to ensure accountability, transparency, and ethical use. Mandate commercial banks to upskill internal auditors through AI-related training programs, including machine learning, natural language processing, and risk prediction and promote the use of AI tools to identify anomalies and high-risk areas for audit focus, improving the precision and timeliness of audit activities. The study also recommends creating cognitive tech standards for the integration of cognitive technologies in internal audits, ensuring consistency across banks. The study recommends providing regulatory sandbox environments to test and validate cognitive technologies in the audit function before full-scale deployment. Enhance Auditor-Tech Collaboration: Formulate policies that foster collaboration between human auditors and cognitive systems, clarifying roles and decision-making protocols.

The study recommends the commercial banks to integrate data analytics into audit plans, enabling continuous monitoring, fraud detection, and real-time decision-making. Encourage banks to establish secure data lakes or warehouses accessible to audit functions for comprehensive analysis and trend tracking. Enhance integration of

cognitive technologies and data analytics. Banks should focus on improving their implementation by investing in training, infrastructure, and integration with existing systems. Develop comprehensive digital transformation strategies by taking a holistic approach in implementing digital technologies to maximize their combined impact on the internal audit function. Regulators should develop policies that guide the ethical and effective use of AI and RPA in internal audit functions. The government and regulatory bodies should incentivize banks to integrate digital technologies to improve transparency and efficiency in auditing.

Recommendations for Future Research

Explore the barriers to cognitive technology and data analytics adoption: Since these technologies did not show a significant impact, future research should examine the challenges hindering their effectiveness in internal audits. Investigate long-term impacts of AI and RPA on audit quality and fraud detection: Further studies should assess how these technologies influence overall audit quality, fraud detection, and regulatory compliance over time.

Figures and Tables

Conceptual framework of the study

A conceptual framework is a research tool intended to assist a researcher to develop awareness and understanding of the situation under scrutiny and communicating it. According to Mugenda and Mugenda (2003) a conceptual framework is a graphical or diagrammatic representation of the relationship between variables in a study.

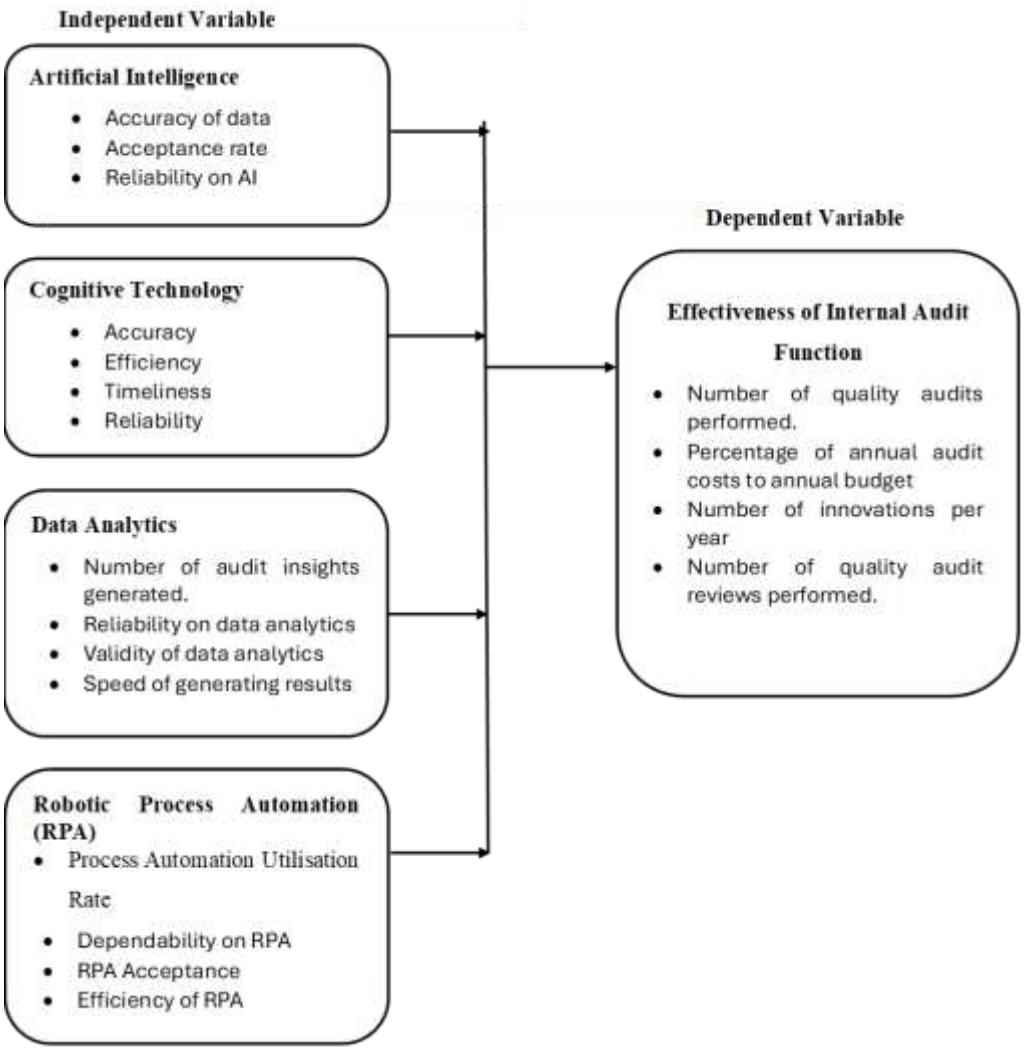

Figure 2.1 Conceptual framework

Source: Literature review (2025)

It is a visual representation of the relationship between independent and dependent variables. In this study, the independent variables were digital technologies; Artificial Intelligence, Cognitive Technology, Data Analytics and Robotic Process Automation while dependent variable were the effectiveness of internal audit function in commercial banks. The study sought to establish the impact the independent variable has on the dependent variable and whether there is a relationship among the variables.

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