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Empirical Assessment of Improved Audit Quality Factors Using Computer-Assisted Audit Tools and Techniques (Caatts)

Beatrice Akoth Owino

Email: baowino@usiu.ac.ke

United States International University – Africa, Kenya

&

Paula M. W. Musuva

Email: pmusuva@usiu.ac.ke

United States International University – Africa, Kenya

Abstract

Computer-Assisted Audit Tools and Audit Tools and Techniques (CAATTs) audits allow information Systems auditors to perform most audit procedures using computerized techniques. This paper aims to present an empirical assessment study of CAATTs in information systems auditing within the institutions of higher learning. The Unified Theory of Acceptance and Use of Technology (UTAUT) was used as a foundation to examine the IS audit quality with the adoption of CAATTs by the Information Systems auditors. This study focuses on the audit of Active Directory services, the most popular identity, and access management platform (IAM) in most organizations today, within a private university in Nairobi, Kenya. The main data collection instruments used were questionnaires with both open-ended and close-ended questions. The SPSS Statistical Analysis was used to verify collected data and generate descriptive statistics, and Structural Equation Modeling (SEM) was used for data evaluation. The study's findings confirmed that most institutions of higher learning do not use CAATTs for real-time auditing of their critical business systems such as Active Directory; risks identification in the Information Systems are realized long after they occur when the traditional audit approaches are used.

Key Words: *Computer Assisted Audit Tools and Techniques, Active Directory, Information System Audit, Audit Quality, Identity, and Access Management, GPU, OU, SPSS*

1. Introduction

Active Directory is an essential information system that universities use for identification, authentication, authorization, and accountability in access management. All users must authenticate through the active directory system, including remote access users working from home during the COVID19 pandemic before accessing IT resources. This shows that the majority of the business processes at a typical university would rely on this technology. Big Data is an emergent field of research that uses data analysis to inform decisions. Higher learning institutions generate large sums of data daily. In the last years, the IT world has been facing a massive increase in the produced data volume, mainly due to the Internet services and the organization of enormous quantities of data, structured or unstructured, provided by these institutions and social media environments. Introducing data protection rules that tightly and disproportionately regulate how the data is used could disrupt these data flows and negatively affect all stakeholders.

The study's concept is expected to help the education sector by changing how information systems audits are approached, securely encouraging interaction between systems, and fulfilling users' requirements and goals. With the emergence of big data, auditing is then a crucial part of the process.

The general objective of the study is to evaluate the impact of the use of Computer Assisted Audit Tools and Techniques (CAATTs) on auditing Active Directory services and to find out whether the quality of the audit is positively affected by the introduction of CAATTs. The specific objectives were: (1) To investigate CAATTs usage on Active Directory services auditing. (2) To develop and evaluate the Active Directory Audit model to measure audit quality.

Ahmi et al., (2015), states that the main objective of the information system's audit is to undertake an independent, regular evaluation of the system's internal controls to provide assurance to the organizations' top management that the information system continues to perform and operate satisfactorily and effectively. Mustapha & Lai (2017) emphasizes the need

for information system auditors to judge whether an information system can secure assets and maintain data integrity to achieve business objectives and deliver efficient resource utilization effectively. CAATTs can be used for independent testing, continuous monitoring and reporting of an organization's networks, databases and computing infrastructure (Mahzan & Lymer, 2014).

Susanto & Meiryani, (2018) define Computer Aided Audit Tools and Techniques as enabling technologies and processes that test the internal logic of information systems that process data and are used for auditing by retrieving and analyzing audit data. Kamal et al. (2020) noted that by adopting CAATs, IS auditors can be empowered to examine controls embedded within information systems. Auditors are able to analyze large data samples, including the whole population analysis of data without the need to sample.

Kamal et al. (2020) further show that traditional methods of information system auditing typically involve sampling only a portion of the population to be audited and then making assumptions about the whole population. Auditors collect data as audit evidence when evaluating controls and help form audit opinions on system controls' presence, reliability, and adequacy. This traditional audit approach is associated with high costs and significant time delays due to information gathering, processing, and reporting (Kamal et al., 2020).

2. Literature Review

CAATTs facilitate the analysis of large volumes of data, sometimes referred to as big data, when looking for anomalies (Tarek et al., 2017). This real-time audit approach increases efficiency and effectiveness when discovering problems and opportunities for business improvement and competitive advantage. It also allows the consistent use of automated transaction analysis and continuous monitoring. The audit information can be used by top management to detect exceptions to controls and compliance regulations that aid in decision-making.

According to Mahzan and Lymer (2014), CAATTs have numerous advantages and benefits when auditing information systems, such as: enabling real-time independent testing and

validation of critical enterprise data and can capture a comprehensive review of all transactions done within the information system rather than a sample if they are well designed and properly implemented.

Oginga, (2013)showed that correct implementation and efficient use of CAATTs within an enterprise can lead to substantial overall savings in time and money. Errors could be reduced by auditing using CAATSs. CAATTs usage saves on the time IS auditors spend performing computational and/or clerical tasks and improve the quality of audit judgments by structuring audit decision processes.

Benefits for IS auditors to use computerized audit include: reducing audit costs, improving audit quality and auditor productivity. With the audit tools and techniques that enable auditors to extract, analyze and review the logic of data, the demand by top management for a trustworthy and relevant audit measure could be fulfilled. The traditional manual method that loads auditors with longer audit periods to detect IS security breaches could also be reduced. Additionally, timely audit reports could be made possible with the support of CAATTs (Oginga, 2013).

The study by Ebrahim M. Mansour, (2016), explains that CAATTs can be in the form of simple procedures as electronic working papers to the sophisticated use of statistical analysis software and Artificial Intelligence tools to discover information systems security breaches within the systems. Different researchers suggest various Computer Assisted Audit Tools and Audit Tools and Techniques (CAATTs) frameworks for efficient, effective, and quality information system audits.

Siew et al., (2017) proposed four independent variables to have an impact on IT Audit Quality as the dependent variable. The independent variables identified were: Auditor IT Knowledge and Competencies (IT Know), Internal Control Knowledge (IC Know), Target System Complexity (Complexity) and Resources. They also controlled for five variables namely: Auditor Independence (AudInd), General Accounting and Audit Knowledge (AccKnow), Audit team familiarity with Auditee (Familiarity), Audit team and audit interaction

(Interaction) and Audit team planning and methodology (Methodology). The study established that Auditor IT Knowledge and Competencies had a strong positive and significant effect on IT Audit Quality. Similarly Internal Control Knowledge and Resources also had a significant effect on IT Audit Quality. However, Auditor Independence and Target System Complexity did not have a significant impact on IT Audit Quality. This study had only one question asking about the use of CAATs in the Resources variable and therefore did not sufficiently focus on the use of CAATs for IT Audit Quality. It also provided a preliminary examination of the factors with a small study sample with a recommendation of more work to be done to test and validate the proposed framework.

Mahzan & Lymer, (2014) proposed five independent variables that can be used measure the Motivations for Successful CAATTs Adoption. The study adopted a mixed method approach in the research in order to explore the research questions. The results of the survey demonstrated that two constructs from UTAUT were found to directly influence the internal auditor's motivation to adopt CAATTs, namely performance expectancy (PE) and facilitating conditions (FCC). In this study, social influence was not included in their model as one of the key factors influencing motivations to successfully adopt CAATTs.

Al-hiyari, (2019) carried out an experiment, which reveals that social influence is insignificant, meaning that the decision to use CAATs is not affected by the social pressure arising from the head of internal audit department, or their peers within the firms, or from the professional accounting bodies. The study examined the determinants of Jordanian internal auditors' acceptance and use of CAATs in audit procedures using UTAUT as the most comprehensive model.

3. Theoretical Framework and Hypotheses

This study on empirical assessment of improved audit quality through CAATTs grounds its theoretical framework on the Unified Theory of Acceptance and Use of Technology (UTAUT). The UTAUT framework has been widely used and endorsed in several studies with various technological innovations and diverse contexts to explain technology adoption assessments

(Mahzan & Lymer, 2014). Based on the solid theoretical foundation and the consistent empirical support presented in previous studies, this study will explore the applicability of the UTAUT framework in investigating the IS auditing in the institutions of Higher Learning in Kenya.

Venkatesh, Morris, Davis, and Davis (2003) examined several theoretical models and formed the Unified Theory of Acceptance and Use of Technology (UTAUT). Venkatesh and his research group reviewed the following theories of technology acceptance: Theory of Reasoned Action (TRA), Theory of Planned Behavior (TPB), Technology Acceptance Model (TAM), the combined form of TAM and TPB (C-TAM-TPB), Model of PC Utilization (MPCU), Innovation Diffusion Theory (IDT), Motivational Model (MM), and the Social Cognitive Theory (SCT). As a result, they proposed a new theory named the unified theory of acceptance and use of technology (UTAUT) to be a suitable form benefiting from the unique characteristics of all other older mentioned theories and models (Momani, 2020).

Hillar Addo, (2014), found that performance expectancy, effort expectancy, social influence, and facilitating conditions are directly associated with behavioral intention to use a technology that affects users' decision to adopt a technology. In this study, performance expectancy, effort expectancy, social influence, and facilitating conditions are directly associated with Information System Audit quality.

The UTAUT model offers a theoretical basis to examine the adoption and usage of different types of technologies. This study employs UTAUT to identify factors influencing audit quality in an information system. UTAUT is used to integrate several previously accepted models to assess the likelihood of success for new technology introductions (Alhabsi, 2017).

A study done by Sarfaraz (2017) on assessing the drivers of usage of CAATTs focused on the UTAUT framework and its comprehensive theoretical frameworks, which are very popular and widely used to predict behavioral intention for the adoption of technology. The UTAUT model is used to investigate the underlying factors that influence the acceptance and use of CAATTs in information systems audit to understand information system audit.

Liebenberg, Benade, & Ellis (2018) explain that the UTAUT was developed with four core determinants of intention and four moderators of key relationships. According to Liebenberg et al. (2018), the four major determining factors of acceptance and use of technology are performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC). In addition, four moderators in the UTAUT model include gender, age, the voluntariness of use, and experience with technology. Furthermore, self-efficacy, anxiety, and attitude towards using technology are mediators of behavioral intention (Ebrahim M. Mansour, 2016). The researchers hypothesized relationships between variables as follows:

Table 1: Research Hypotheses

No.	Hypothesis
H1	Technology (Performance Expectancy) will have a positive and significant influence on Audit Quality
H2	IT Complexity (Effort Expectancy) will have a positive and significant influence on Audit Quality
H3	Management Support (Facilitating Conditions) will have a positive and significant influence on Audit Quality
H4	The social influence will have a positive and significant influence on Audit Quality

4. Research Methodology

The methods used in this study aimed to acquire the best results in Active Directory auditing. The research design allowed the researcher to implement, study, investigate Active Directory as a type of Information system and finally measure the audit quality after interacting with a Computer Assisted Audit Tools and Audit Tools and Techniques (CAATT) installed on a simulated domain created on the Microsoft Azure platform. Mijwel, (2018), describes Microsoft Azure as the offer of Infrastructure and Platform as a Service. Azure provides a platform for clients to develop and deploy software. The following part contains the detail of methodologies adopted to complete this research.

On the Microsoft Azure platform, a Virtual Active Directory Server was installed. On the simulated domain environment, virtual host machines were deployed, and the virtual AD was

used to create users, who were then logged into the virtual host machines. The ManageEngine tool audited the simulated domain and generated a comprehensive real-time audit report. ManageEngine tool introduces Real-Time Change Auditing for Windows Active Directory. It sends real-time email alerts when something changes, and the interface shows a live feed of the alerts. Changes made by administrators, users, machines, groups, GPOs, OUs, and others are updated.

Areas audited by the CAATT

User Logon Activities	Logon Failure	Last Logon on the workstation	Logon on active member Servers
Logon Activities on the Domain Controller	Recent User Logon Activities	Last login activity on workstations	RADIUS Logon on computers

With the help of UTAUT theory, the researchers developed and distributed an interview questionnaire using the constructs about usage and user acceptance of CAATTs to selected respondents from the ICT department, the Internal Audit departments, and IST audit students. All the questions were formulated for good understanding to make them easy to respond to. The data was then analyzed using Statistical Package for the Social Sciences (SPSS) and summated rating (or Likert) scale, mainly descriptive statistics and analysis methods. The data analysis was based on the empirical findings and related to the theoretical framework. The

experiments were done on the virtualized environment as per the below screenshots.

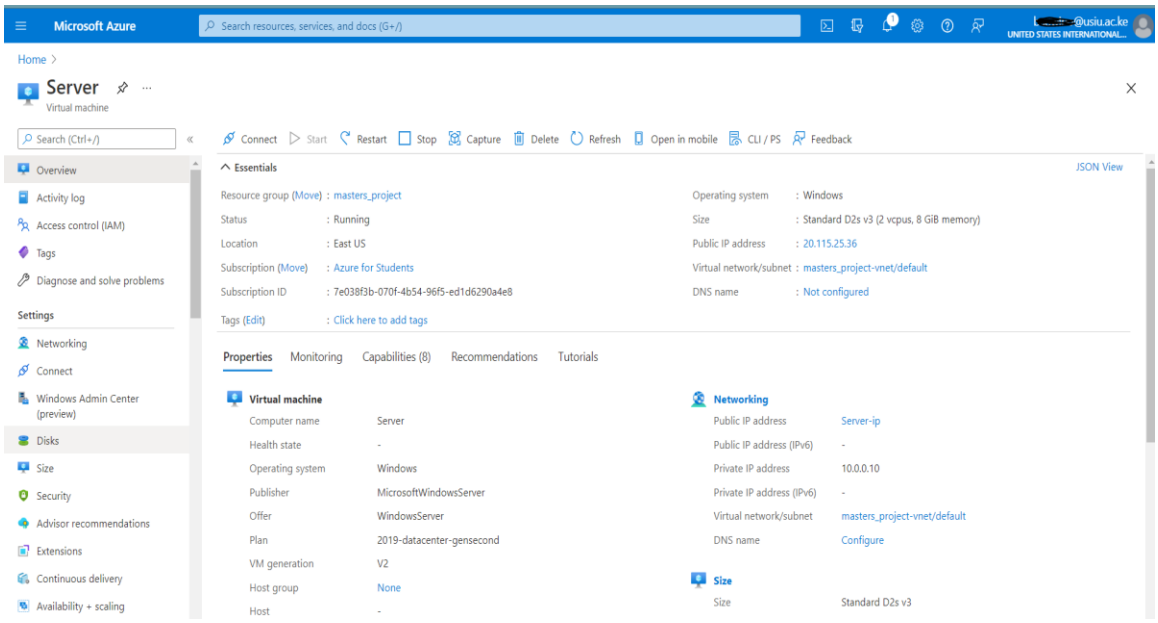

Figure 1: Microsoft Azure Simulated Cloud Environment

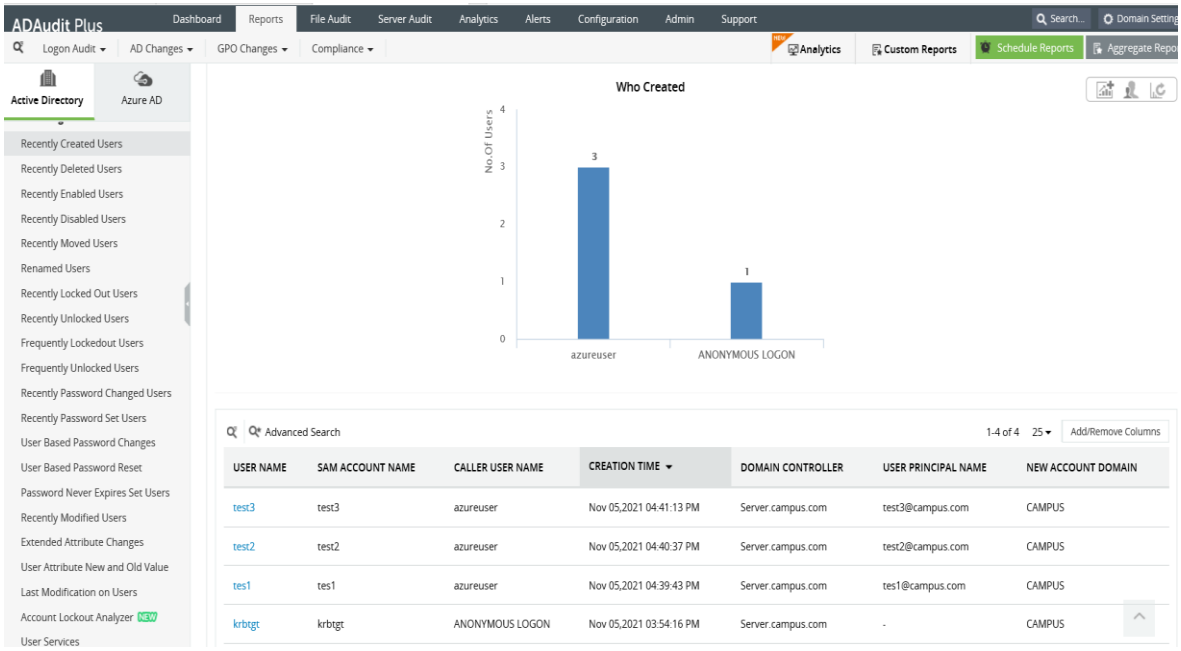

Figure 2: ManageEngine Audit report on Created Users

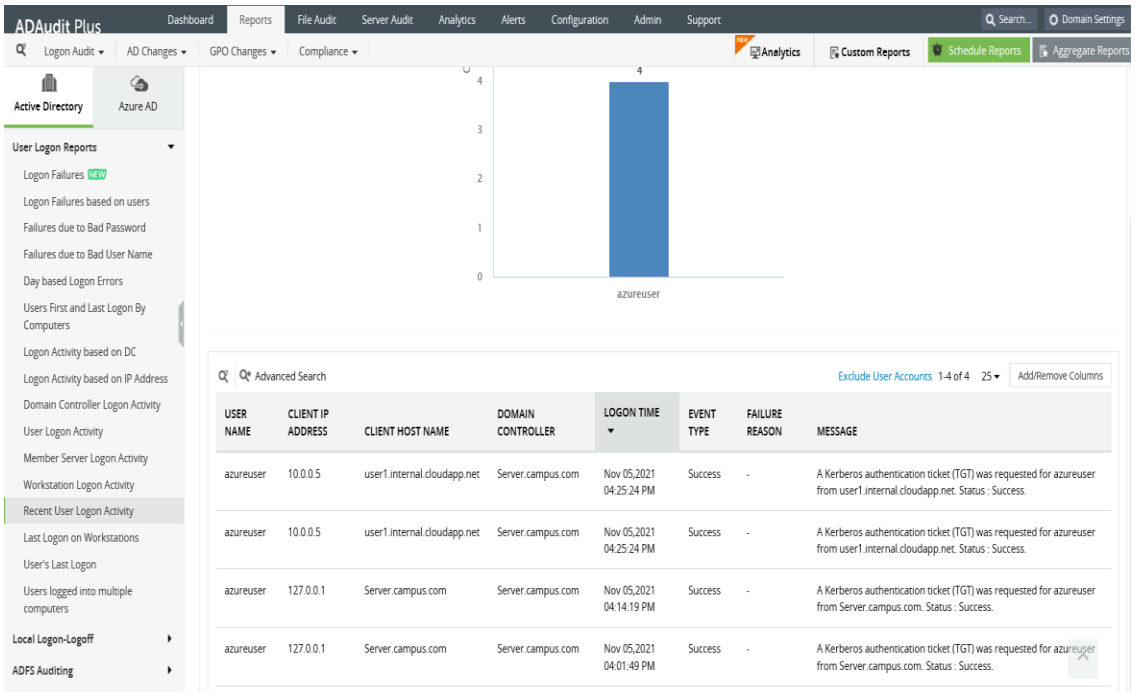

Figure 3: ManageEngine Sample Report on Domain User's activity

5. Results and Discussion

The results of this research study support a more robust and accurate picture of the factors affecting the quality of information system audit within institutions of higher learning and can be used as strategies to overcome information system audit limitations using CAATTs.

This research constitutes an attempt to obtain knowledge of the factors that contribute to information system audit quality with CAATTs usage by information system auditors. It concluded that Technological factors, Management factors, and social Influence factors, are well supported by the findings from the quantitative data; hence the factors outlined in each dimension can be used as guidance when discussing issues on information system audit quality using CAATTs implementation within the institutions of higher learning.

Table 2: Measure of Audit Quality

	Strongly Agree	*Agree*	*Not Sure*	*Strongly Disagree*	*Disagree*
Reduction of audit errors	48.4%	40.7%	7.7%	1.1%	2.2%
Integrity of audit data	40.7%	49.5%	7.7%	2.2%	0.0%
Accuracy of audit results	40.7%	47.3%	9.9%	0.0%	2.2%
Efficiency of audit	42.9%	45.1%	8.8%	1.1%	2.2%
Timely Completion of audit	40.7%	44.0%	14.3%	0.0%	1.1%
Cost-effective audit	35.2%	39.6%	22.0%	1.1%	2.2%

From the results, respondents strongly agreed that inclusion of CAATTs in IS audit reduces audit errors, 49.5% agreed that CAATTs ensures audit data integrity, 47.3% agreed on audit efficiency, 44% agreed on timely completion of the audit when CAATTs are used, and 39.6% agreed with the cost-effectiveness of the audit when CAATTs are used.

Computer-Assisted Audit Tools and Audit Tools and Techniques (CAATTs) can aid in improving the quality of audit within the Institutions of Higher learning because they are effective techniques in detecting security breaches, misappropriation of user rights, and file-sharing, amongst other benefits. Hence, Institutions of Higher education can utilize the factors identified in the research study to encourage the acceptance and usage of CAATTs in the information system audits. It is expected that the use of CAATTs will help the information system auditors automate many routines and manual audit tasks and allow them to dedicate their time for higher-level tasks, such as understanding the business model and assessing various risks.

Correlation between Audit Quality and factors that affect CAATTs usage

A Pearson correlation test was done to investigate the correlation between Audit quality and Active Directory audit predictors. The active directory predictors include technological, management, IT Complexity, and social influence factors. The results showed that there is a

strong positive significant correlation between audit quality and Active Directory predictors at **(p=0.000, r=0.706)** for **technological factors**, **(p=0.000, r=0.602)** for **management factors, (p=0.000, r=0.465)** for **IT complexity factors** and **(p=0.000, r-0.533)** for **social factors** as shown in Table 3.

Table 3: Correlation between Audit Quality and Active Directory Predictors

		Technological factors	*Management factors*	*Complexity factors*	*Social factors*
Audit Quality	Pearson Correlation	0.706**	0.602**	0.465**	0.533**
	Sig. (2-tailed)	0.000	0.000	0.000	0.000
	N	90	89	90	90
***. Correlation is significant at the 0.01 level (2-tailed).*					

Assumptions for Multiple Linear Regression.

Assumptions for the multiple linear regression model helps to investigate whether the data fit for regression model analysis or not. The assumptions include normality, linearity, multicollinearity, and Homogeneity/Homoscedasticity.

Normality Test

A normality test was done to investigate whether the data is normally distributed or not. The data is normally distributed when the skewness is between -1 and +1 and Kurtosis figures are between -3 and +3. The results showed that the skewness values are between -1 and +1 and the kurtosis values were between -3 and +3. This is an indication that the data of the variables to be subjected to the multiple linear regression model analysis is normally distributed as required by the regression model assumptions, as shown in Table 4

Table 4: Normality Test

	N	*Skewness*	*Kurtosis*
Technological factors	90	-1.0	2.137

Management factors	89	-.747	1.218
Complexity factors	90	-.863	1.230
Social factors	90	-.540	1.023
Audit Quality	90	-1.0	2.718

Linearity Test

A linearity test was done to investigate if audit quality has a significant relationship with the technological factors, management factors, IT complexity factors, and social factors. A significant linear relationship is an assumption for the regression analysis. The results showed that audit quality has a significant linear relationship with technological factors at (p=0.000, F=93.5), management factors at ((p=0.000, F=54.099), IT Complexity factor at (p=0.000, F=31.68) and social Influence factors at (p=0.000, F=39.081) as shown in table 4.12.

Table 5: Linearity Test

		Sum of Squares	*df*	*Mean Square*	*F*	*Sig.*
*Audit Quality * Technological factors*	Linearity	19.430	1	19.430	93.500	.000
*Audit Quality * Management factors*	Linearity	14.020	1	14.020	54.099	.000
*Audit Quality * Complexity factors*	Linearity	8.424	1	8.424	31.680	.000
*Audit Quality * Social factors*	Linearity	11.086	1	11.086	39.081	.000

Multicollinearity Test

A multicollinearity test was done using the Variance Inflation Factor (VIF). Multicollinearity is a state of very high intercorrelations or inter-associations among the independent variables. A VIF value of less than 10 is an indication that multicollinearity is not significant. The results

showed that all the VIF values were below 10, meaning that the multicollinearity was not significant as required by the regression assumption, as shown in table 6.

Table 6: Multicollinearity Test

Model		**Collinearity Statistics**	
		Tolerance	VIF
	Technological factors	0.527	1.896
	Management factors	0.507	1.973
	Complexity factors	0.564	1.773
	Social factors	0.638	1.567
a. Dependent Variable: Audit Quality			

Homogeneity /Homoscedasticity Test.

A homoscedasticity test was done to investigate whether the data was homogeneous or not. Levene statistics test was done to test the homogeneity. A significant Levene statistics value indicates that the data was not homogeneous, and Levene statistics is considered to be significant when **p<0.05**. The results showed that all the Levene statistics values were not significant with all p>0.05. This indicates that the data was homogeneous and met the multiple linear regression model analysis assumption, as shown in table 7.

Table 7: Homogeneity /Homoscedasticity Test

Test of Homogeneity of Variances				
	Levene Statistic	df1	df2	Sig. (p)
Technological factors	1.089	11	74	0.382
Management factors	1.256	11	73	0.268
Complexity factors	2.460	11	74	0.111
Social factors	1.477	11	74	0.158

Multiple Linear Regression Model Analysis

Multiple linear regression model analysis was done to investigate how audit quality is affected by active directory predictors. The model summary table shows that R= 0.763, meaning the

correlation between the two variables is positive and strong, while R Square= 0.583, indicating that Active directory predictors affect 58.3% of the audit quality, as shown in table 8.

Table 8: Model Summary

Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.763[a]	.583	.563	.43799

a. Predictors: (Constant), Social factors, Management factors, Complexity factors, Technological factors

The ANOVA table shows that the regression model is significantly linear at **(F=29.346, P=0.00)**. The significant model is $Y = \beta0 + \beta1X1 + \beta2X2 + \beta3X3+ \beta4X4$. Where Y= Audit quality, X1= Technological Factors, X2= management factors, X3= IT Complexity factors, and X4= Social influence factors. B_0= Constant, Bi's=Influence of Active directory predictors on the audit quality where i=1, 2, 3, 4 as shown in table 9.

Table 9: The ANOVA

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig. (p)
1	Regression	22.518	4	5.630	29.346	.000[b]
	Residual	16.114	84	.192		
	Total	38.632	88			
a. Dependent Variable: Audit Quality						
b. Predictors: (Constant), Social factors, Management factors, Complexity factors, Technological factors						

Coefficients

Coefficients table shows that the model **Y=** $\beta0 + \beta1X1 + \beta2X2 + \beta3X3+ \beta4X4$, is **Y= 0.520+ 0.436$X_1$ + 0.213X2 + 0.022X3+ 0.242X4.** This is an indication that increasing technological factors by one unit, increases audit quality by 0.436 units, increasing management factors by one unit, increases audit quality by 0.213 units, increasing IT complexity factors by one unit,

increases audit quality by 0.022 units and increasing Social influence factors by one unit, increases audit quality by 0.242 units as shown in Table 10.

Table 10: Coefficients

Model / Coefficients		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	Std. Error	Beta		
1	(Constant)	.520	.351		1.481	.142
	Technological factors	.436	.096	.439	4.527	.000
	Management factors	.213	.096	.219	2.208	.030
	Complexity factors	.022	.086	.024	.251	.002
	Social factors	.242	.090	.238	2.702	.008
a. Dependent Variable: Audit Quality						

Structural Model Results

Assessing the structural model, which includes testing the theoretical hypothesis and the relationships between latent constructs provided through the employed SEM technique and SPSS AMOS software. Table 12 presents the path coefficients and their significance for each construct, while the proposed structural model is depicted in Figure 6. Overall, the results of the proposed research model show a good fit: ($\chi 2$ = 580.505, df = 226, $\chi 2$/df = 2.569, GFI =0.910, TLI = 0.700, CFI = 0.754, IFI = 0.763, RMSEA = 0.132). Overall, all the constructs were supported by the data except IT Complexity.

The main constructs (PE, FC, and SI) to QUALITY were supported in this study. As shown in Table 11, performance expectancy (PE) positively predicted information system audit quality (0.42, $p < 0.001$); therefore, this construct was supported. Second, effort expectancy (EE) the construct was not supported (0.012, $p<0.844$). Third, social influence (SI) was found to positively predict information system audit quality (0.36, $p<0.001$). Fourth, facilitating conditions (FC) positively predicted information system audit quality (0.25, $p < 0.001$),

providing support for the construct as shown in table 11and the resulting SEM model shown in Figure 4.

Table 11: Structural Model Results

Path			*Estimate*	*Square Correlation*	*Hypothesis testing result*
Quality	<-->	Technological	0.699	0.488601	Supported
Quality	<-->	Complexity	-0.006	0.000036	Not supported
Quality	<-->	Management	0.188	0.035344	Supported
Quality	<-->	Social	0.287	0.082369	Supported

Root Mean Square Error of Approximation (RMSEA) analyses the hypothesized model issues. For a good fit, the model RMSEA has to be valued between 0 or below 1. This model meets that requirement.

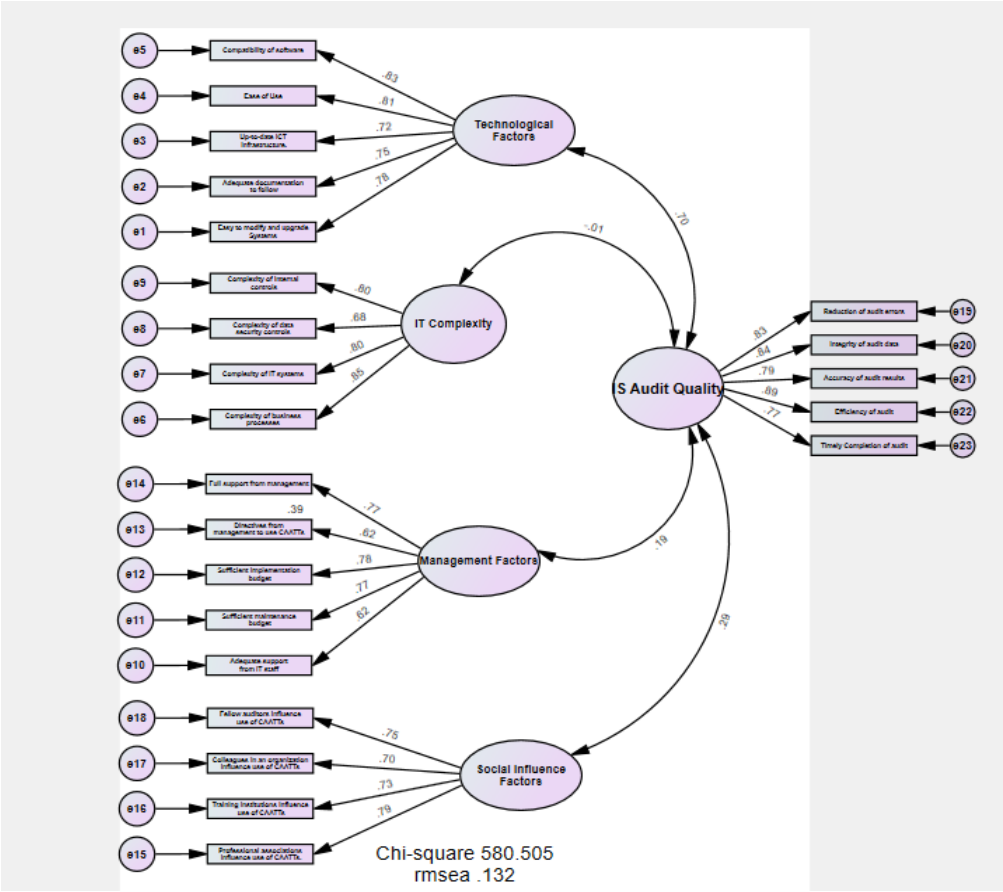

Figure 4: Structural model with standardized path coefficients

6. Conclusion and Recommendations

From the results and findings, there is increasing reliance on information systems by organizations globally. In a typical university, an academic Enterprise Resource Planning (ERP) system is used for admissions, academic registry, student affairs, and finance, thereby making it is a critical business platform that the organization fully relies on and must have high confidentiality, integrity, and availability for business success. The study analyzed the influence of independent variables on Information System audit quality using CAATTs. Using structural modeling, the theorized relationships in the proposed research model were tested and analyzed.

UTAUT Based Model with Core Factors

The UTAUT model extracted components and their constructs from the proposed model are discussed next. The first component is Technological factors with constructs related to factors that affect information system audit quality. These include Compatibility of software, Ease of Use, Up-to-date ICT infrastructure, adequate documentation to follow, and Easy to modify and upgrade Systems. This finding was supported by other researchers' conclusions, who have acknowledged that technological factors are a vital component affecting audit quality borrowing from the UTAUT models.

IT Complexity was another component of the proposed model with constructs such as Complexity of internal controls, Complexity of data security controls, Complexity of IT systems, and Complexity of business processes. The findings of this model component were not as strong as other components. The correlation between information system audit quality and IT Complexity was at $0.465^{**,}$ showing not so very strong relationship.

Management support was also a component of the model with constructs such as full support from management, directives from management to use CAATTs, sufficient implementation budget, sufficient maintenance budget, and adequate support from IT staff. The UTAUT model's Effort Expectancy (EE) measures the level of ease associated with using technology and the degree to which an individual feels that utilizing it would be effortless.

Finally, the last component of the model was the social influence. It had constructs such as Fellow auditors influence the use of CAATTs, Colleagues in an organization influence the use of CAATTs, and Training institutions influence the use of CAATTs and professional associations influence the use of CAATTs.

The regression analyses show that performance expectancy, facilitating conditions, and social influence were statistically significant in explaining the factors that influence audit quality when the information system auditors employ CAATTs. The research study outcome and result are consistent with the findings of both Al-Hiyari et al. (2019) and (Mahzan & Lymer, 2014). This result suggests that information system auditing using CAATTs improves audit quality.

When information system auditors believe that the benefits gained from using these automated tools will increase their job efficiency, they are more willing to use CAATTs. As a result, management should boost the use of CAATTs and invest more in training programs to educate information system auditors about the benefits of using such tools and assist them in staying current with evolving technology.

Despite the rapid growth of IT in business processes within learning institutions in Kenya today, and encouragement from regulators, prior research suggests that CAATTs adoption by individual information system auditor's remains relatively low. CAATTs usage is important since CAATTs may increase audit effectiveness and efficiency.

The results show that social influence is significant, implying that CAATTs usage may be influenced by social pressure from fellow Information Systems auditors, professional associations and bodies, or peers within the firms. In this context, Lai (2017) found out that the social influence factor is significant in a mandatory setting, whereas involuntary setting, it is not significant.

The findings in this research study may have important implications for both information system auditors and management boards in the institutions of higher learning. First, CAATTs can help institutions of higher learning improve the quality of their information systems audits since they are excellent tools for detecting system failures and misuse of IT assets and resources. As a result, these institutions might use the parameters highlighted in this research study to support the use and acceptance of information system auditing methodologies.

Given that the decision to accept and use CAATTs is voluntary, institutions of higher learning should recognize the consequences of their policies and culture on Information Systems auditors' intention to adopt CAATTs. There should be an integration of CAATTs in information system audits, thus reviewing the IS audit policies and compliance policies within institutions of higher learning.

The research is also recommended to be done in any other institutions of higher learning in Kenya and mostly within the universities. CAATTs usage in the institutions of higher learning has several benefits. It's, therefore, recommended that future studies be done in more institutions of higher learning.

Lastly, another element for future work that researchers might want to consider is the aspect of CAATTSs in Continuous Auditing. This is the use of real-time auditing tools to discover control weaknesses as they happen in a dynamic environment, e.g., Active Directory. This is being increasingly adopted due to its proactive approach instead of the conventional auditing, which is reactive or post-mortem in its function.

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