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Determinants of Performance Audit Effectiveness in Tigray Regional State

By

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Abstract

Performance audit is essential for enhancing accountability, transparency, and efficient utilization of resources in the public sector. The present research examines the key determinants influencing the effectiveness of performance audits in Tigray Regional State, Ethiopia. Based on a mixed-methods research approach, the study combines the quantitative data collected from 50 performance auditors and 20 audited public sector entities with qualitative data through interviews. The study uses binary logistic regression to examine the impact of six independent variables: management support, auditor ability, and accountability, follow-up after audit, legal requirement, and information technology on audit effectiveness. The findings reveal that management support, competent auditors, information technology, and follow-up after audit significantly enhance audit effectiveness. At the same time, accountability and legal requirements do not show a statistically significant impact. In addition, there is a good practice of the auditors in selected public sectors on the performance audit and the majority of the public sectors are efficient and economical in acquiring. This research contributes to limited regional-level empirical evidence for Ethiopia on performance auditing and offers policy-relevant implications for improving public sector audit effectiveness.

Keywords*: performance audit effectiveness; public sector; binary logistic regression; auditor competence; management support; Tigray; Ethiopia.*

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1. Introduction

Performance auditing has emerged as an influential instrument in public financial administration aimed at ensuring that government agencies operate with economy, efficiency, and effectiveness the "3Es" of Performance audit (INTOSAI, 2019). Performance audits interest whether or not public resources are expended on returns measurable way (OECD, 2020). They also contribute towards greater levels of transparency and accountability corrective actions and organizational learning (Morin, 2001).

Globally, performance auditing has gained momentum, particularly in developing countries where public sector inefficiencies are felt more expansively. As noted by Alon and Galor (2021), performance audits help reinforce governance's systemic weaknesses by detecting loopholes in operations and providing actionable recommendations for reform. In Africa, public sector reforms have integrated performance audits to enhance fiscal responsibility and trust in public institutions (AfroSAI-E, 2022).

Performance auditing was first implemented in Ethiopia in the early 1990s by the Federal Office of the Auditor General (OFAG) as a component of a larger public financial management reform program.

Proclamation No. 669/2010 requires the OFAG and its regional counterparts to carry out performance audits to determine if public resources are being used for the reasons for which they were intended (OFAG, 2015). Despite these legal provisions, performance audits in Ethiopia, especially at the regional level, tend to be less effective due to institutional, technical, and managerial issues (Regassa, 2016; Yodit, 2016).

At the regional level of the Tigray Regional State, the Regional Office of the Auditor General (TNRSOAG) is responsible for conducting performance audits. However, subjective experience and audit reports point to actual constraints on audit impact. Challenges include weak management support, lack of professional auditors, poor technological infrastructure, weak mechanisms of accountability, and low post-audit follow-ups (TNRSOAG, 2019).

Previous studies on performance auditing in Ethiopia have focused predominantly on federal government institutions (Elkana, 2018; Rashid, 2014). While such research is useful, it generalizes audit effectiveness without investigating region-specific drivers. Moreover, most existing research relies on descriptive analysis only and lacks empirical depth in determining the determinants of performance audit effectiveness (Tadesse, 2015; Masood & Lodhi, 2015). Hence, regional and contextual drivers of audit effectiveness in regions like Tigray are untouched.

Despite the growing institutionalization of performance auditing in Ethiopia, empirical data assessing its performance is still lacking especially at the regional level. Existing research carried out so far has tended to be focused on financial audits and has employed descriptive approaches with few rigorous statistical underpinnings. Additionally, although most research records the existence of performance audit practice, there are a limited number of studies that investigate under what conditions these audits work to improve governance and service delivery or not.

There is a lack of studies that integrate quantitative and qualitative evidence in exploring institutional, technological, and managerial forces driving the impact of audits. Furthermore, most of the existing research overlooks critical variables such as post-audit follow-up, auditor competence, and the

strategic use of information technology variables that are extremely significant in low-capacity public administrations.

The study addresses these loopholes by focusing on the regional public sector organizations in Tigray, under-represented in performance audit effectiveness research. Applying a mixed-methods approach and binary logistic regression to identify determinants of audit effectiveness. Variable inclusion is often neglected in local studies, post-audit follow-up, and IT capacity. Providing a contextual understanding of the performance audit dynamics by presenting triangulated findings from auditees and auditors.

2. Objectives of the Study

The general objective of this study is to examine the determinants of performance audit effectiveness in selected public sector institutions in Tigray Regional State, Ethiopia.

The specific objectives are to:

1. To evaluate the performance audit practices in public sector entities, including perceptions, awareness, and application of the performance audit.

2. To investigate the influence of management support, accountability mechanisms, auditor competence, legal mandates, post-audit follow-up, and information technology on the effectiveness of performance audits.

2. Literature Review

2.1. Performance Audit Concept

Performance audits are a unique form of audit that establishes if government programs and public sector organizations achieve their desired results with consideration for economy, efficiency, and effectiveness (INTOSAI, 2019).

Unlike typical financial or compliance audits, performance audits are value-based, focusing on how public sector resources are spent and if they yield measurable results (OECD, 2020). They further assist in promoting higher transparency and accountability by provoking corrective actions and institutional learning (Morin, 2001).

2.2. Determinants of Performance Audit Effectiveness

Management Support

Several studies reveal that support from top management is a success factor for performance and internal audits. Managers influence audit scope, data accessibility, and action taken on recommendations. Sarens and De Beelde (2006) argue that the availability of resources and communication by top management leads to higher audit impact. Recent evidence by Gebru and Teshome (2021) in Ethiopia confirms the existence of a positive association between audit use and leadership commitment.

Auditor Competence

Audit depth and quality are a function of auditor competence, professional education, and familiarity

with the industry. Abu-Azza (2012) determines that competent auditors will have a higher chance of providing credible and actionable outputs. Yodit (2016) and Elkana (2018), in the Ethiopian context, identify that knowledge and training gaps limit the effectiveness of regional audit offices. Ongoing professional education and recruitment of qualified experts (e.g., CIA, CPA) are essential.

Information Technology (IT)

IT tools can help improve audit, risk assessment, data collecting, and analytical planning. According to Gelinas and Wheeler (2011), integrating IT makes the audit more timely and reliable. Alemu and Haile's (2022) study in the Oromia area found that an electronic audit tool performance audit resulted in improved documentation and a shorter audit length. However, the majority of Ethiopia's regional offices have digital repositories and automated systems.

Post-Audit Follow-Up

Without adequate follow-up, even the most useful audit reports can be ineffective. Haiderinejad et al. (2012) and Nirmala (2011) established that mechanisms of follow-up after audits are important in ensuring follow-up on their recommendations. Tadesse (2015) observed that the lack of monitoring systems in Ethiopian institutions in the region stains audit credibility.

Legal Mandate

A strong legal regime enables auditors to be independent, to get access to data, and to issue binding recommendations. However, research shows that legal requirements are nominal. In a study, Bawole and Mohammed (2017) found that weak enforcement mechanisms undermine audit powers in most African nations.

In Ethiopia, Rashid (2014) discovered that although audit regulations are comprehensive, their efficacy is limited by institutional and political interference. The presence of accountability structures such as parliamentary oversight, monitoring by the media, and internal punishment increases audit effectiveness. As per Bernard (2013), performance audit recommendations stand a better chance of implementation in accountable culture environments. Inconsistent accountability arrangements within regions of Ethiopia, however, were found by Regassa (2016) to lower audit responsiveness.

Accountability Mechanisms

Strong accountability frameworks ensure that audit recommendations lead to corrective actions. The Institute of Internal Auditors (2006) emphasizes that public accountability is enhanced when performance audits are used as tools for governance evaluation. However, Rashid (2014) notes that in many developing countries, accountability remains weak due to political interference and lack of enforcement.

Conceptual Framework

This model proposes that performance audit effectiveness (PAE) is influenced by six primary independent variables, grounded in public audit literature and institutional theory:

Independent Variables

• Management Support (MS): Organizational commitment, resources, and communication from top management.

• Auditor Competence (ADCOM): Professional qualifications, training, and skills of auditors.

• Information Technology (IT): Availability and usage of audit software, data systems, and digital tools.

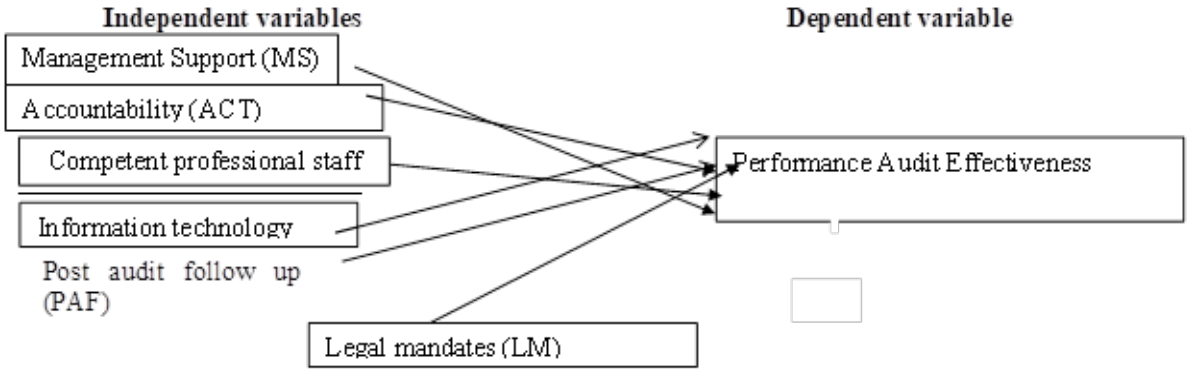
• Legal Mandate (LM): Institutional independence and implementation of audit law.

• Accountability (ACT): Systems to ensure public officials are accountable for their audit reports.

• Post-Audit Follow-Up (PAF): Institutional mechanisms for monitoring the implementation of recommendations.

Dependent Variable

• Performance Audit Effectiveness (PAE): To what degree audits lead to improved economy, efficiency, and effectiveness in the provision of public services.



Source: Adopted from Yodit, (2016) with modification.

3. Research Approach

Research Design and Approach

A mixed-methods approach was adopted in this study that combined quantitative survey data and qualitative data from interviews to comprehensively examine the determinants of performance audit effectiveness in the Tigray Regional State. This research design offers a strong triangulation of data, which enhances findings for validity and reliability.

Explanatory and descriptive research design was employed to accomplish the research objective. Explanatory research design was used to establish causal relationships between independent and dependent variables (Saunders et al., 2009). Additionally, descriptive research design facilitated a clear reflection of the existing performance audit practices and determinants that influence their effectiveness (Polit & Hungler, 2004).

Target Population and Sample Size

The research population consisted of the public sector and Tigray Regional State Office of the Auditor

General (OAG) personnel who were subjected to performance audits. In particular, there were 192 employees. A purposeful sample of 50 performance auditors from the regional offices of the Office of the Auditor General (OAG) was selected, all of whom possess the requisite knowledge and skills in performance auditing. They included the auditors, top managers, and supporting staff in audits. In addition, all the 20 audited public sector bodies in the capital that were performance audited within the period of relevance were included to give audited organizations' perspectives. It provided comprehensive coverage of the population of interest and enhanced the representativeness and validity of findings.

Data Sources and Methods of Data Collection

As per the objectives of the study, two questionnaires of varied structures were prepared and administered for the collection of primary data for the two respondent groups: firstly, to the National Regional State of Tigray office of the Auditor General (TNRSOAG) and secondly, to the Tigray national regional state audited public sectors at bureau levels. The study utilized both primary and secondary sources of data. The Primary Data were collected through the use of a structured questionnaire with a five-point Likert scale (1 = strongly disagree, up to 5 = strongly agree) and interviews.

The determinants of audit effectiveness questionnaire were adapted from available studies (Elkana, 2018; Regassa, 2016; Yodit, 2016). Secondary Data were collected from audit reports, manuals, operating procedures, and internal reports of the TNRSOAG and audited public sector entities. The standardized questionnaire collected quantifiable data to be analyzed statistically and qualifiable data to be used for narrative analysis.

Methods of Data Analysis

Combining descriptive and inferential statistical methods was part of the data analysis process: The data was described and interpreted using descriptive statistics, such as frequencies, percentages, mean values, and standard deviations. Using binary logistic regression and STATA13 software, the inferential analysis demonstrates the link between the independent and dependent variables. Narrative analysis was used for qualitative responses, giving quantitative results more depth and context.

Model Specification

Given that the dependent variable performance audit effectiveness is binary (coded as 1 for "effective" and 0 for "ineffective"), this study employs a binary logistic regression model to examine the relationship between performance audit effectiveness and its hypothesized determinants. Logistic regression does not assume a linear relationship between the dependent and independent variables.

Logistic regression can handle ordinal and nominal data as independent variables. The dependent variable must be categorical and finally, the independent variables need not be an interval, not normally distributed, no linearly related, and no equal variance within each group (Seyoum and Perede, 2004).

Gujarati (2004) states that the following is the econometric specification of the cumulative logistic probability distribution model used in this study: where Pi is the likelihood that the performance audit effectiveness (PAE) entity has upgraded given Xi. Xi represents the ith explanatory variables, α & βi are regression parameters to be estimated. e is the base of the natural logarithm. For ease of interpretation of the coefficients, a logistic model could be written in terms of the odds and log of odd or marginal effect. The marginal effect is the probability that a performance audit is effective (Pi) to the probability that the

performance audit is not effective (1- Pi).

That is,

$$\left(\frac{P_i}{1-P_i}\right) = e^{Z_i} \quad (2)$$

Taking the natural logarithm of equation (2) yields:

$$\ln\left(\frac{P_i}{1-P_i}\right) = Z_i = \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_m X_m \quad (3)$$

If the disturbance term Ui is taken into account, the logit model becomes:

$$Z_i = \alpha + \sum_{i=1}^{m} \beta_i X_i + U_i \quad (4)$$

In this study, since only two options are available, namely "effectiveness" or "ineffectiveness" a binary model was set up to define Y=1 for a situation where a performance audit is effective and Y=0 for a situation where a performance audit is not effective. In this study, since only two options are available, namely "effectiveness" or "ineffectiveness" a binary model was set up to define Y=1 for a situation where a performance audit is effective and Y=0 for a situation where a performance audit is not effective.

The logistic regression in this study can, therefore, be specified as

$$P(PAE) = \ln\left(\frac{P_i}{1-P}\right) = \beta + \beta\, MS + \beta\, ADCOM + \beta\, IT + \beta\, LM + \beta\, act + \beta_6\, PAF + U_i$$

Where: X1-n are explanatory variables, β1-n are the slope coefficients, and Ui is an error term PAE = performance audit effectiveness. MS= management support ACT= accountability, ADCOM = adequate and competent professional PAF= post-audit follow-up, IT= information technology, LM= legal mandate.

Measurement of Variables

As already mentioned above, the dependent variable in this study is the performance audit effectiveness and the independent variables are measured using the five-point Likert Scale of-1-Strongly Disagree, 2- Disagree, 3-Neutral, 4-Agree, and 5-Strongly Agree all the indicators.

To quantify the dependent variable, performance audit effectiveness, and this study used binary logistic regression analysis. The operationalization of the study was based on mean scores with a coded value of 0 for ineffective performance audits and 1 for effective ones. The dummy variables characterize dichotomous responses. According to Tadesse's (2015) consensus agreement, the researcher considered the average mean value of 3.42 and above (agree) as effective codded as "yes" whereas the average mean value of 3.41 and below (disagree) was considered as ineffective (no). To assess the descriptive statistical findings of mean and standard deviation, the researcher re-assigned Tadesse's, citing Best

(1977). The reason behind using this model is when the dependent variables of interest are binary; it is advisable to use a specific model such as the binary logit model (Grilli and Rampichini, 2015).

4. Results and Discussion

4.1. Perception of Performance Audit

The researcher used and reassigned Tadesse's (2015) scales, which cited Best (1977), to evaluate the descriptive statistical results of mean and standard deviation. The following scale of interpretation was used: For "Strongly Disagree," mean values between 1.00 and 1.80 were used. According to 1.81-2.61, "Disagree," 3.42 to 2.62 denote "Neutral," According to 3.42-4.21, "Agree," and 4.22-5.00, "Strongly Agree."

Table 4.1.Perception of Audited Public Sectors on Performance Audit

Item	N	Mean	Standard Deviation
Performance audits build public trust and control service delivery.	20	4.15	1.182
Audit manuals and guidelines are crucial for audit work.	20	4.00	1.124
Performance audits analyze the economic aspects of service delivery.	20	4.20	1.196
Audits enhance the utilization of government resources.	20	4.35	0.933
Performance audits evaluate the effectiveness of service delivery.	20	4.00	1.076
Audits ensure compliance with laws and regulations.	20	4.15	0.875
Audits function as a whistle-blower mechanism.	20	4.00	1.026
Audit recommendations inform decision-making.	20	4.35	0.813
Recommendations address serious problems effectively.	20	4.20	0.768
Recommendations are realistic and feasible.	20	4.25	0.966
Average		4.165	0.996

Source, (Survey result, 2019)

As shown in Table 4.1 above, the survey analysis reveals an average mean of 4.165 and a standard deviation (SD) of 0.996. The results indicate that the majority of respondents agree that audited public sectors have positive perceptions of performance audits. This aligns with Morin (2001), who emphasizes that performance audits support organizational improvement by identifying areas for corrective action and fostering transparency. Public sector employees demonstrate a strong understanding of the benefits of performance audits. This awareness is critical for promoting the implementation of audit recommendations and ensuring their effectiveness. The findings underscore the need for continued efforts to maintain and improve the positive perceptions of performance audits within the public sector.

4.2. Awareness of Performance Audit

Table 4.2: Awareness Level in Audited Public Sectors

Item	N	Mean	Standard Deviation
Time allocated for seminars/workshops on performance audits.	20	2.35	1.461
Awareness creation on audit methods and benefits.	20	2.75	1.482
Defined the scope and objectives of performance audits.	20	2.20	1.320
Availability of databases, guidelines, and orientation programs.	20	2.45	1.500
Cooperation with regional audit offices.	20	1.95	1.230
Frequency of training sessions for public-sector auditors.	20	1.90	1.290
Average		2.27	1.3805

Source, (Survey result, 2019)

As shown in Table 4.2, the weighted mean value of 2.27 indicates a general lack of awareness about performance audits among public-sector respondents. Many disagreed with statements about the availability of workshops and collaboration between auditors and public-sector entities. This lack of awareness adversely impacts the effectiveness of performance audits, as highlighted by previous studies (Nusrat, 2012; Chew et al., 2016).

4.3. Performance Audit Economy, Efficiency, Effectiveness, and Environment

According to Waring and Morgan (2007), performance audits aim to evaluate the audited entity's performance and management in terms of economy, efficiency, and effectiveness and to provide recommendations on improving specific performance areas.

Table 4.3.: Performance Audit Economy

Items	Obs.	Mean	SD
Resource management minimizes costs	20	3.95	1.234
Alternative cost assessments	20	4.05	0.999
Cost-benefit analyses conducted	20	4.00	0.973
Cost-saving through bulk buying	20	4.30	0.801
Auctions for resource acquisition	20	4.15	0.988
Procurement activities aim for economies of scale	20	3.95	1.191
Average Mean and SD		4.067	1.031

Source, (Survey result, 2019)

Table 4.3 presents the overall average mean score of 4.067 and a standard deviation of 1.031 indicating that the majority of respondents agree that audited public sectors maintain economic practices in day-to-day operations. Respondents emphasized that organizations effectively employ auctions to purchase resources at the best price, in the right amount, and of the right quality. This reflects the role of performance audits in promoting cost-effective procurement and resource management. The findings align with Elkana (2008) and Mahbuba (2012), who emphasized the significance of economic practices

in public sector audits. Elkana (2008) discovered that by making sure that only necessary and acceptable resources were purchased, performance audits in Kenya's public sector decreased unnecessary spending.

Kenya's Public Finance Management Act (2015), Regulation 42(1)(b), underscores the need for accounting officers to safeguard public funds and ensure allocations are applied appropriately. However, the findings contrast with Bawole and Ibrahim (2015), who observed limited improvement in the public sector economy in developed countries despite performance audits. These results reinforce the importance of integrating cost-saving measures, cost-benefit analyses, and bulk purchasing strategies to enhance the economic performance of public sector institutions.

Table 4.4: Performance Audit Efficiency

Items	Obs.	Mean	SD
Effective control systems minimize resource use	20	4.00	1.169
Procedures for deficiency remediation	20	3.90	1.071
Cost and time minimization	20	3.70	1.220
Avoids duplication and overstaffing	20	4.10	1.165
Skilled employees for public service	20	3.90	0.852
Minimum inputs for maximum output	20	4.15	1.182
Average Mean and SD		3.95	1.33

Source, (Survey result, 2019)

As shown in Table 4.4, the average mean score of 3.95 and standard deviation of 1.33 indicate that respondents generally agree on the efficient utilization of public resources. Key aspects include having skilled employees (Mean: 3.90, SD: 0.852) and setting goals to use minimum inputs for service delivery (Mean: 4.15, SD: 1.182).

Respondents also highlighted efforts to avoid duplication of efforts and overstaffing (Mean: 4.10, SD: 1.165. It ensures that benefits justify the costs incurred in administration. Efficiency examines planned versus actual delivery milestones and benchmarks comparisons among programs achieving similar outcomes using different pathways.

This is reflected in increased productivity, lower unit costs, and adjustments to new work patterns through training and procedure reviews. In conclusion, efficiency emphasizes "spending well" and guarantees that the greatest amount of output is obtained from the resources at hand (Syed, 2000).

This aligns with Eze and Ibrahim (2015), who argue that efficiency audits focus on output to achieve higher results with limited resources. However, these findings contradict Kristin (2013), who observed minimal evidence of performance audits contributing to efficiency improvements in the public sector.

Table 4.5: Performance Audit Environment

Items	Obs.	Mean	SD
Recognition of environmental costs	20	2.00	1.260
Compliance with environmental laws	20	2.20	1.281
Regulations Enhancing Environmental Quality	20	2.05	1.356
Proper waste disposal	20	4.60	0.503
Improved program management for emissions	20	2.10	1.447
Average Mean and SD		2.59	1.17

Source: (Survey Results, 2019)

Descriptive statistics are summarized in Table 4.5 responses in the performance audit environment category suggest significant areas for improvement: The overall mean score of 2.59 and standard deviation of 1.17 indicate a general lack of focus on environmental considerations in public sector audits. Most respondents disagreed or strongly disagreed with statements related to recognizing environmental costs, complying with environmental regulations, and enhancing environmental quality. An exception to the negative trend is the high agreement a mean score of 4.60, and the SD of 0.503 regarding proper waste disposal practices for reducing environmental risks. This suggests that public sector institutions Excel in this specific area, regularly identifying and disposing of unused or damaged assets. Responses to whether institutions improve program management for reducing emissions and waste scored a low mean of 2.10, highlighting a need for better alignment with sustainability objectives.

The findings reveal a gap in integrating environmental performance considerations into public sector audits, particularly regarding valuing environmental costs, liabilities, and assets; adhering to government regulations; and organizational policies on environmental issues. Implementing comprehensive strategies for emission reduction and sustainable program management. The strong performance in waste disposal reflects a potential foundation for building broader environmental initiatives within public sector institutions (OACG, 2014). According to Jacobus (2017), an environmental performance audit focuses on the assessment of whether appropriate consideration and due regard have been afforded to the effects resource utilization may exert on the environment.

4.4. Descriptive Statistics of Independent Variables

Table 4.6: Summary of Descriptive Statistics of Independent Variables

Variables	N	Min.	Max.	Mean	Std. Deviation(SD)
Management Support	50	1.00	5.00	4.21	0.8988
Competent Professionals	50	1.00	5.00	4.24	0.9167
Information Technology	50	1.00	5.00	4.23	0.9093
Legal Mandate	50	1.00	5.00	3.94	0.8313
Accountability	50	1.00	5.00	3.75	1.7718
Post-Audit Follow-Up	50	1.00	5.00	4.19	0.8895

Source: (Survey Results, 2019)

4.4.1. Management Support

As shown in Table 4.6, the mean score of 4.21 and standard deviation of 0.8988 indicate strong agreement among respondents that management support is critical for effective performance audits. The provision of enough resources, financial aid, training, and fostering communication between auditors and management are all crucial elements of support in the audit engagement. Regular engagement ensures that auditors can operate effectively, aligning their efforts with the overall audit objectives.

4.4.2. Competent Professionals

Table 4.6 presents the mean score of 4.24 and a standard deviation of 0.9167, respondents underscored the significance of skilled and competent auditors for efficient audits. Competency encompasses formal education, professional experience, and continuous development. The audit should follow international auditing standards, such as AFROSAI-e, which enhances auditors' efficacy and professionalism (INTOSAI, 2004).

4.4.3. Information Technology

The descriptive statistics result in Table 4.6. A mean score of 4.23 and a standard deviation of 0.9093 highlight the vital role of Information Technology (IT) in modern auditing. Respondents noted that IT tools significantly enhance audit efficiency by reducing manual work and improving the accuracy and security of audit processes. All phases of auditing planning, execution, and monitoring are supported by IT integration, which raises the standard of the audit as a whole.

4.4.4. Legal Mandate

Table 4.6 provides a summary of descriptive statistics. The mean score of 3.94 and standard deviation of 0.8313 indicate that while respondents acknowledge the importance of a strong legal mandate, they are concerned about institutional interference and lenient enforcement.

4.4.5. Accountability

The above table, 4.7, shows a mean score of 3.75 and a standard deviation of 1.7718, indicating that respondents recognize gaps in public sector accountability. Although auditor accountability is evident, managerial and operational accountability deficiencies for resource utilization remain problematic. These gaps undermine the effectiveness of audits and the broader accountability framework.

4.4.6. Post-Audit Follow-Up

Table 4.6, with a mean score of 4.19 and a standard deviation of 0.8895, respondents strongly agreed on the importance of regular follow-up on audit recommendations. Post-audit follow-up ensures accountability and validates the impact of audit interventions, promoting continuous improvement in performance and resource management.

In general. The descriptive statistics reveal strong agreement on the critical factors influencing performance audits. While aspects such as management support, IT integration, and auditor competence are well-established, addressing challenges related to legal mandate enforcement and gaps in accountability frameworks can significantly enhance the effectiveness of audits. Strengthening

these areas will lead to improved audit outcomes and greater public sector accountability.

Table 4.7: Descriptive Results of Performance Audit Effectiveness

It is better to measure the result of performance audit effectiveness as effective or not effective rather than measuring it in order ranking. So, Likert scale questionnaires for the dependent variable were coded as 0 for ineffective and 1 for effectiveness of the audit. Based on prior research (Sisay, 2018; Tadesse, 2015), performance audits with a mean response score of 3.42 and above were coded as "Yes" (effective), while scores below 3.41 were coded as "No" (ineffective).

Performance Audit Effectiveness	Frequency	Percent	Cumulative (%)
No (0)	10	20	20
Yes (1)	40	80	100
Total	50	100	100

Source: (Survey Results, 2019)

From Table 4.7, 80% of respondents rated the performance audit as effective, reflecting a generally positive perception of its value and impact. The study identifies that effectiveness is influenced by public sectors' perceptions and behaviors, including their cooperation with auditors, understanding and acceptance of recommendations, and Commitment to implementing action plans based on audit findings. Effective audits are associated with improved organizational performance through implemented recommendations, Contributions to public debates and governance, and positive perceptions of the audit's added value. In addition, Success depends on the willingness of auditees to internalize audit recommendations and actively cooperate with auditors.

Effectiveness is also linked to external conditions such as staff readiness, timing of audits, organizational reforms, and governmental priorities.

According to Morin (2003), performance audit effectiveness is determined by three interrelated aspects: trust in the auditors' skills, neutrality, and recommendations; changes and improvements resulting from the audit findings; and raising awareness and promoting transparency in governance.

4.5. Econometric Analysis

Important Tests of the Model

Goodness-of-Fit Test

The Hosmer-Lemeshow goodness-of-fit test evaluates how well the predicted values from the logistic regression model align with the observed data. This test posits that the closer the observed and predicted frequencies match, the better the model's fit.

It is widely regarded as one of the most appropriate measures for binary logistic regression models (Hosmer & Lemeshow, 1980). Although there are no definitive benchmarks for evaluating model fitness, a model with an overall predictive power of at least 3% is generally considered satisfactory (Anders, Ari, & Magnus, 2006).

The results are summarized in the table below:

Table 4.8: Logistic Model Goodness-of-Fit Test

Metric	Value
Number of observations	50
Number of covariate patterns	50
Pearson chi2 (60)	37.87
Prob > chi2	0.0666

Source: (STATA output, 2019)

Table 4.8 indicates the p-value (0.0666) is greater than the 0.05 threshold, indicating that the null hypothesis (i.e., the model fits the data well) is accepted. This suggests that the logistic regression model is an appropriate fit for the dataset.

Test for Model Specification Error

A specification error occurs when the model omits relevant variables or includes unnecessary ones. To test for this, a regression was run with the observed dependent variable (Ẋ) against the predicted values (ŵhat) and their squares (ŵhat-squared) as independent variables. The significance of the coefficient for ŵhat-squared (_hatsq) indicates the presence of specification errors.

Table 4.9: Test for Model Specification Error

PAE	Coef.	Std. Err	Z	P>|z	95% Conf. Interval]	
_hat sq	-.0563216	.095867	-0.59	0.557	-.2442193	.131576

Source: (STATA output, 2019)

In Table 4.9, the p-value for _hatsq (0.557) is not significant at the 5% level, indicating no evidence of specification error. Thus, the null hypothesis (i.e., the model is correctly specified) cannot be rejected.

Test for Multicollinearity

From the Table below multicollinearity refers to a high correlation between independent variables, which can inflate standard errors and reduce the reliability of coefficient estimates. The Variance Inflation Factor (VIF) was used to detect multicollinearity. According to Chartered, Hadi, and Price (2000), a VIF value exceeding 10 indicates severe multicollinearity, while acceptable VIF values range between 1 and 10 ($1 < VIF < 10$). So, all VIF values of independent variables are below 10 and their reciprocal values (1/VIF) exceed 0.10, there is no multicollinearity problem.

Table 4.10: Test for Multicollinearity

Variable	VIF	1/VIF
Act	1.17	0.8521
Ms	1.17	0.8534
It	1.11	0.9026
Adcom	1.12	0.9087
Lm	1.09	0.9144
Paf	1.03	0.9702
Mean VIF	1.11	

Source: (STATA output, 2019)

Test for Omitted Variable Bias

Omitted variable bias occurs when relevant variables are excluded from the model, potentially causing a correlation between the error term and independent variables. The Ramsey RESET test was employed to detect omitted variable bias. The test results are as follows: Ramsey RESET test: $F(3, 40) = 1.45$, Prob > F = 0.0529. Since the p-value (0.0529) exceeds the 0.05 threshold, the null hypothesis (i.e., the model does not suffer from omitted variable bias) cannot be rejected. Consequently, there is no proof that the model requires any extra variables.

4.6. Binary Logistic Regression Analysis and Hypothesis Testing of Variables

This section examines the determinant factors of performance audit effectiveness using regression analysis to test the impact of six independent variables. Binary logistic regression was employed to estimate the potential effects of each explanatory variable on performance audit effectiveness. These variables include management support, adequate and competent professionals, information technology, legal mandate, accountability, and post-audit follow-up. Emphasis was placed on interpreting statistically significant variables by examining their logit coefficients and marginal effects. The table below presents the binary logistic regression results, including the p-values and marginal effects of the explanatory variables, evaluated at a 5% significance level.

4.7. Marginal Impacts of Explanatory Variables

Marginal effects indicate the impact of a one-unit change in an explanatory variable on the probability of the dependent variable's outcome.

Table 4.11 presents the marginal effects of the binary logistic regression:

Performance audit effectiveness	dy/dx	Std.err	Z	p>|z|	(95% C. I X)		
MS	.1378894	.06031	2.29	0.022	.019675	.256104	3.95333
ADCOM	.1922706	.09299	2.07	0.039	.010007	.374534	4.22643
IT	.1147454	.05087	2.26	0.024	.015036	.214455	3.87214
LM		.07069	-1.09	0.274	-.21592	.061176	4.02214
ACT	.0542696	.07504	0.72	0.470	-.092813	.201352	4.58023
PAF	.1736508	.07337	2.37	0.018	.317448	.029854	3.72271

Source: (STATA Output, 2019)

4.7.1. Management Support

As shown in Table 4.11 management support is a critical success factor for nearly all organizational programs and processes.

The regression results indicate that management support significantly impacts performance audit effectiveness at a 5% significance level a p - p-value of 0.022. The regression coefficient reveals that as management support increases, the probability of performance audit effectiveness improves by 13.79%, holding other factors constant. The study finds adequate support through regular discussions between management and performance auditors, which enhances audit effectiveness. This highlights management support as a key determinant of performance audit effectiveness.

This suggests that resources, training, and technical support from management are essential for effective audits. Management support encompasses resource provision, training, technical assistance, education, and the recruitment of external expertise for audit work. It also includes promoting the performance audit process and communicating its benefits within the organization. These findings align with earlier research by Abraham (2015), Shewamene (2014), Cohen and Sayag (2010), Meskerem (2018), Elnaz (2016), Haidarinejad et al. (2012), and Sarens and De Beelde (2006). These studies underscore that top management support is essential for audit task effectiveness and acceptance of performance audits within the organization.

4.7.2. Competent Auditor

The effectiveness of performance audits is considerably impacted by auditor competency, as shown in Table 4.11 demonstrates that auditor skill has a considerable impact on the efficacy of performance audits, with a statistically significant result at the 5% level (p-value 0.039).

This emphasizes how crucial it is to have an adequate number of qualified auditors for efficient audit work. According to the regression analysis, when all other variables are held constant, greater auditor competency results in a 19.23% increase in performance audit effectiveness. This underscores the importance of having a sufficient number of skilled auditors for effective audit work. Competency factors include educational background, proficiency, experience, communication skills, and continuous training and development.

The findings highlight that auditors with formal education, professional certifications such as certified

internal auditor (CIA) or certified public accountant (CPA), and practical experience enhance governance and audit quality. These results align with studies by Yodit (2016), Abu-Azza (2012), Tadele (2012), Nusrat Ferdousi (2012), and Morin (2001). Competent auditors possess the skills and knowledge necessary for operational or performance audits, ensuring effective and timely task completion.

4.7.3. Information Technology

Table 4.11 presents how Information technology (IT) significantly impacts performance audit effectiveness, as shown by a 5% significance level (with P- a value of 0.024). The marginal effect indicates that the availability and use of IT increase the probability of performance audit effectiveness by 11.47%. The availability of IT resources improves performance and makes it possible for auditors to use cutting-edge technologies in their job. IT resources enhance efficiency and accuracy during various audit phases, including data analysis and operational assessments. The findings align with prior studies by Gelinas and Wheeler (2011), Salehi and Husini (2011), and Curtis et al. (2009). These studies emphasize that IT improves audit quality by enhancing analytical processes, content testing, and operational assessments, contributing to better governance and service delivery.

4.7.4. Post-Audit Follow-Up

Table 4.14 presents how Post-audit follow-up significantly impacts performance audit effectiveness, as shown by a 5% significance level (p-value of 0.018). The marginal effect indicates that regular follow-up increases the probability of audit effectiveness by 17.36%. This demonstrates the importance of monitoring the implementation of performance audit recommendations. Regular follow-ups ensure that audit recommendations are implemented effectively, leading to improved performance outcomes. Effective follow-up ensures that audited bodies implement recommendations, evaluate outcomes, and report improvements.

These findings are consistent with studies by Nirmala (2011) and Yodit (2016). Monitoring results, evaluating effects, and reporting accomplishments are all examples of appropriate follow-up procedures that guarantee the audit's goals are fulfilled and its efficacy is accomplished.

4.7.5. Accountability and Legal Mandate

As shown in Table 4.11 regression analysis indicates that legal mandate negatively impacts performance audit effectiveness, with an insignificant coefficient (β coefficient of -0.0774, p-value of 0.274). This implies that legal mandates do not significantly influence audit effectiveness and may sometimes hinder the process due to external pressures from higher officials. As a result, the fourth hypothesis is rejected.

Similarly, the effectiveness of performance audits is not significantly impacted by accountability (β value of 0.054, and p value of 0.470).

4.8. Triangulation of quantitative and qualitative Results

The study used both quantitative (survey responses) and qualitative (interviews) methods to assess performance audit effectiveness in the Tigray Regional State. By triangulating these results, the study gains a more comprehensive understanding of the key factors influencing audit effectiveness.

Table 4.12. Performance Audit Practices quantitative and qualitative Findings

Performance Audit Dimension	Quantitative Findings	Qualitative Findings (Interviews)	Triangulation Interpretation
Perception	Generally positive perception (Mean: 4.16)	Public officials recognize audits as important but some see them as fault-finding rather than improvement tools.	Despite agreement on the importance of audits, a culture shift is needed to emphasize improvement over fault-finding.
Awareness	Low awareness (Mean: 2.27)	Officials report a lack of training, minimal engagement with auditors, and poor knowledge of performance audits.	Awareness levels are low across both data sources, indicating a need for training and sensitization.
Economy	Cost-saving measures in procurement exist (Mean: 4.07)	Budget constraints and weak financial analysis were noted.	Public entities attempt to apply cost-effective procurement but lack structured financial evaluation mechanisms.
Efficiency	Efficiency is moderate (Mean: 3.95)	Bureaucratic delays, wastage of resources, and lack of skilled staff affect performance audit efficiency.	While audits identify inefficiencies, follow-through on solutions is weak due to structural issues.
Effectiveness	Effectiveness rated at (Mean: 3.76)	Depending on management involvement, audit recommendations are not always implemented.	Performance audits contribute to effectiveness but depend on management's willingness to act.
Environment	Poor integration of environmental concerns (Mean: 2.59)	Environmental sustainability is largely ignored except for waste management.	Environmental audits are not a priority, indicating a need for stronger regulations.

Source: (Survey, 2019)

Table 4.13. Determinants of Performance Audit Effectiveness quantitative and qualitative Findings.

Determinant	Quantitative Findings (Regression Analysis)	Qualitative Findings (Interviews)	Triangulation Interpretation
Management Support	Significant (13.79% impact on effectiveness, p=0.022)	Interviewees emphasize the need for management engagement and resources.	Strong management support enhances audit effectiveness, Adequate support includes resources, financial backing, training, and facilitating discussions between management and auditors.
Competent Professionals	Significant (19.23% impact, p=0.039)	Auditors need more training and expertise enough sector-specific knowledge is necessary.	Having skilled auditors improves audit quality, but there are gaps in professional training.
Information Technology (IT)	Significant (11.47% impact, p=0.024)	IT tools enhance efficiency, but many public institutions have modern audit technology.	Technology is crucial and widely adopted, enhancing audit effectiveness.
Post-Audit Follow-Up	Significant (17.36% impact, p=0.018)	The follow-up processes assess the implementation of recommendations and measure the impact of audits.	Regular follow-up on audit recommendations significantly contributes to performance improvements.
Legal Mandate	Not Significant (p=0.274)	The legal framework exists but enforcement is weak.	The existence of laws alone is not enough stronger enforcement mechanisms are needed.
Accountability	Not Significant (p=0.470)	Accountability mechanisms are inconsistent across institutions.	Accountability structures need strengthening to ensure compliance with audit recommendations.

Source: (Survey result, 2019)

5. Conclusion and Recommendations

Conclusion

The results confirm that management support, auditor skills, information technology, and post-audit follow-up are significant determinants of effective performance audits. These factors foster an environment that makes it possible for audits to support better resource use, governance, and service

delivery. On the other hand, the effectiveness of audits was not statistically impacted by legal power or accountability mechanisms.

Results also reveal gaps in awareness, training, and coordination between auditors and public entities. Although auditees have shown good opinions regarding performance audits, overall efficacy is compromised by low awareness and inconsistent adoption of suggestions.

In addition, despite the presence of minimal legal frameworks, poor follow-through in audits is undermined by low enforcement and stakeholder participation. Finally, the integration of environmental dimensions into performance audits remains limited, with respondents being largely unaware of their importance beyond regular waste disposal procedures. This necessitates mainstreaming environmental concerns into audit design and evaluation.

Recommendations

Audit teams require ongoing financial, logistical, and emotional assistance from regional leaders and bureau heads.

Top management must actively participate in the discussion of audit results and implementation strategies.

The Tigray Office of the Auditor General (OAG) should invest in regular training in performance audit techniques, sector analysis, and communications.

Auditor recruitment should prefer certified professionals with public sector experience.

Audit offices should adopt computerized audit management systems and software that can automate data collection, analysis, and reporting.

Professional development programs must include audit software and data visualization tools training.

There must be precise rules and deadlines in place to track how audit recommendations are being implemented.

Periodic follow-up audits have to be conducted to measure actual changes after previous recommendations.

Though not statistically significant in this study, accountability cannot be ignored; institutions need to create clearly defined responsibility matrices for dealing with audit recommendations.

Annual performance appraisals of the public managers are to become routine and include responsiveness to audit results.

Existing laws on audits should be revised to include binding enforcement provisions with penal sanctions for non-compliance.

Regional audit bodies' autonomy and authority are to be strengthened.

To learn more about the efficiency, effectiveness, economy and the importance of audits, auditors and managers in the public sector should occasionally participate in workshops, seminars, and orientation exercises.

Environmental factors should be incorporated in audit covers, especially in areas such as infrastructure, agriculture, and urban planning.

Cooperation with environmental specialists and regulatory agencies can improve the quality of audits in this field.

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