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The Effect of Risk-Based Internal Audit on the Effectiveness of Perumda Tirtanadi's Financial Performance with ISO 9001 Implementation

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ABSTRACT

This study aims to examine the effect of Risk-Based Internal Audit and ISO 9001 implementation on the effectiveness of financial performance at Perumda Tirtanadi and to test the moderating role of ISO 9001 in the relationship between Risk-Based Internal Audit and financial performance effectiveness. The study employed a quantitative cross-sectional survey design using a structured questionnaire administered to 21 respondents from Perumda Tirtanadi. Data were analyzed using Partial Least Squares–Structural Equation Modeling (PLS-SEM). The results indicate that Risk-Based Internal Audit does not have a significant effect on financial performance effectiveness ($\beta = -0.077$, $t = 0.185$, $p = 0.853$, $f^2 = 0.004$). In contrast, ISO 9001 implementation shows a statistically significant relationship with financial performance effectiveness ($\beta = 1.021$, $t = 2.508$, $p = 0.012$, $f^2 = 0.640$). However, the interaction effect between ISO 9001 implementation and Risk-Based Internal Audit is not significant ($\beta = -0.018$, $t = 0.310$, $p = 0.757$), indicating that ISO 9001 does not moderate the relationship. The structural model explains 89.5% of the variance in financial performance effectiveness ($R^2 = 0.895$). These findings suggest that, within the context of this study, ISO 9001 implementation is significantly associated with perceived financial performance effectiveness, whereas Risk-Based Internal Audit and its interaction with ISO 9001 are not. Given the cross-sectional design, perception-based measurement, and relatively small sample size, the findings should be interpreted as associative rather than causal.

Introduction

Regional-Owned Enterprises (BUMDs) play a strategic role in delivering public services while maintaining organizational sustainability and financial accountability. Among these enterprises, regional water utilities face increasing pressure to provide reliable services, improve operational efficiency, strengthen governance, and maintain financial performance amid rising operational costs and public service obligations. Therefore, strengthening governance mechanisms through effective internal control systems, risk management, and quality management has become an important strategy for improving organizational performance. Internal auditing and quality management systems are increasingly recognized as strategic instruments that not only ensure compliance but also support value creation and organizational sustainability (COSO, 2017; IIA, 2024).

Perumda Tirtanadi, as one of Indonesia's regional water utilities, is responsible for providing clean water services to communities in North Sumatra. In fulfilling this responsibility, the organization faces various operational and financial risks, including budget efficiency, cost control, service continuity, and governance effectiveness (Armanda et al., 2025). Consequently, the effectiveness of financial performance becomes an important indicator of organizational sustainability because it reflects the organization's ability to manage financial resources efficiently while maintaining service quality. In this context, internal audit and quality management practices are expected to strengthen governance and improve organizational performance (Soh et al., 2024 ;Kristanti et al., 2019; putri et al., 2024).

Perumda Tirtanadi's financial condition can be seen through the following income statement.

Table 1. Profit and Loss (L/R) Report of Perumda Tirtanadi for 2021 – 2024

Year	Revenue	Production	Profit and Loss
2021	760.018.545.478,00	695.581.778.987,00	64.436.766.491,00
2022	755.848.442.121,00	689.783.985.766,00	66.064.456.355,00
2023	801.251.841.640,00	734.791.369.363,00	66.460.472.277,00
2024	863.539.845.403,00	796.152.351.855,00	67.387.493.548,00

Source: sumutprov.go.id/indeks-pengelolaan-keuangan-daerah, accessed: 05 August 2025

The financial performance of Perumda Tirtanadi during 2021–2024 shows an interesting phenomenon. Although nominal profit increased from IDR 64.44 billion in 2021 to IDR 67.39 billion in 2024, revenue and operational costs also increased over the same period. Based on the available financial statements, the estimated Net Profit Margin (NPM) was approximately 8.48% in 2021, 8.74% in 2022, 8.29% in 2023, and 7.80% in 2024. These figures indicate that while nominal profit continued to increase, profitability tended to decline after 2022 because operating expenses increased faster than revenue growth (Raimon et al., 2025; Muklis, 2022). Therefore, improvements in nominal profit should not automatically be interpreted as improvements in financial performance effectiveness. Instead, this phenomenon raises questions regarding whether governance mechanisms such as Risk-Based Internal Audit and ISO 9001 implementation contribute to financial performance effectiveness.

Risk-Based Internal Audit (RBIA) has evolved from a traditional compliance-oriented function into a strategic governance mechanism that focuses audit resources on organizational risks with the greatest potential impact. According to the Institute of Internal Auditors (IIA), RBIA supports organizations by providing assurance and consulting services that enhance governance, risk management, and internal control (Wahyu et al, 2025;

Nuraningsih et al, 2024). Likewise, the COSO Enterprise Risk Management framework emphasizes that internal auditing contributes to organizational value creation through systematic risk identification, assessment, monitoring, and follow-up of audit recommendations. Accordingly, Risk-Based Internal Audit in this study is conceptualized through several dimensions, namely risk assessment, audit planning, audit execution, reporting, and follow-up of audit recommendations, all of which are expected to strengthen organizational governance and improve financial performance (Durack, 2024).

In addition to internal auditing, organizations increasingly implement Quality Management Systems based on ISO 9001:2015 to improve operational consistency and organizational effectiveness. ISO 9001 emphasizes customer focus, leadership, evidence-based decision making, process management, continuous improvement, and risk-based thinking. Through standardized operating procedures, documentation, corrective actions, and continuous monitoring, ISO 9001 is expected to improve process efficiency, reduce operational errors, strengthen accountability, and ultimately support financial performance. Consequently, ISO 9001 implementation may not only exert a direct influence on financial performance but may also strengthen the effectiveness of Risk-Based Internal Audit by providing a structured framework for implementing audit recommendations.

Previous studies have reported inconsistent findings regarding the relationship between Risk-Based Internal Audit and financial performance. Several studies reported that Risk-Based Internal Audit improves organizational performance through stronger internal control, governance, and risk mitigation. In contrast, other studies found insignificant effects because audit recommendations were not effectively implemented or integrated into managerial decision making. Similarly, studies examining ISO 9001 generally conclude that quality management systems improve operational efficiency and organizational performance. However, empirical evidence regarding the moderating role of ISO 9001 in strengthening the relationship between Risk-Based Internal Audit and financial performance remains limited, particularly within Regional-Owned Enterprises providing public utility services.

Based on these inconsistencies, several research gaps can be identified. First, previous studies have primarily examined the direct effect of Risk-Based Internal Audit or ISO 9001 implementation on organizational performance separately, while limited attention has been given to their combined influence within a single conceptual framework. Second, empirical evidence regarding the moderating role of ISO 9001 implementation remains scarce. Third, studies focusing on regional water utilities are still limited, despite their strategic role in delivering essential public services and maintaining financial sustainability.

Accordingly, the novelty of this study lies in integrating Risk-Based Internal Audit and ISO 9001 implementation within a single PLS-SEM model by positioning ISO 9001 implementation as both a direct predictor and a moderating variable affecting Financial Performance Effectiveness in a Regional-Owned Enterprise. This study also extends the application of governance and quality management theories to the context of public water utility organizations. Therefore, this study aims to (1) examine the effect of Risk-Based Internal Audit on Financial Performance Effectiveness, (2) examine the effect of ISO 9001 implementation on Financial Performance Effectiveness, and (3) examine whether ISO 9001 implementation moderates the relationship between Risk-Based Internal Audit and Financial Performance Effectiveness at Perumda Tirtanadi.

Method

This study employed a quantitative explanatory research design using a cross-sectional survey approach to examine the relationships among Risk-Based Internal Audit, ISO 9001 implementation, and Financial Performance Effectiveness at Perumda Tirtanadi. According to Sugiyono (2018), An explanatory design was selected because the study aimed to test the direct effects of Risk-Based Internal Audit and ISO 9001 implementation, as well as the moderating effect of ISO 9001 on the relationship between Risk-Based Internal Audit and Financial Performance Effectiveness. Data were collected at a single point in time using structured questionnaires distributed to employees involved in governance, auditing, and financial management activities.

Population and Sampling

The target population consisted of all employees directly involved in the implementation of internal auditing, quality management systems, internal control, and financial management at Perumda Tirtanadi. These employees were selected because they possess sufficient knowledge regarding the implementation of Risk-Based Internal Audit, ISO 9001 quality management practices, and organizational financial performance. The accessible population comprised 21 employees, consisting of personnel from the Internal Audit Division, Internal Control Unit, Quality Management Division, and Finance Division. Because the accessible population consisted of only 21 eligible employees, this study employed a saturated sampling (census) technique, whereby all members of the population were included as research respondents (Sugiyono, 2019).

Consequently, the final sample consisted of 21 respondents, representing the entire accessible population involved in governance and financial control activities at Perumda Tirtanadi.

Sample Size Consideration

The relatively small sample size reflects the limited number of employees directly responsible for internal auditing, quality management, and financial management within the organization. Therefore, all eligible respondents were included to maximize data coverage. Partial Least Squares Structural Equation Modeling (PLS-SEM) was selected because it is suitable for exploratory and predictive research involving relatively small samples and complex structural models (Hair et al., 2022). Nevertheless, the findings should be interpreted cautiously because the limited sample size may reduce statistical power, particularly in detecting interaction (moderating) effects. Accordingly, the results are interpreted as evidence obtained from the entire accessible population within Perumda Tirtanadi rather than as findings intended for broad statistical generalization.

Data Collection Procedure

Data collection techniques are methods used by researchers to obtain data that are relevant and support research objectives. The data collection techniques in this study are questionnaires, documentation studies, and interviews. Data analysis in this study will be carried out using a quantitative approach, which aims to test the hypothesis that has been formulated. This study will use Smart PLS (Partial Least Square) software as an analysis tool, which is very useful in handling complex models and in situations where the data does not meet the assumptions of normality (Hair et al., 2017).

Model testing in this study was carried out through the analysis of the outer model and inner model. In the outer model stage, the validity of the convergence is assessed through the value of outer loading and Average Variance Extracted (AVE), where the indicator is declared valid if ithas an outer loading of ≥ 0.70 and AVE ≥ 0.50. The validity of the discriminant is then tested using the Fornell–Larcker Criterion and cross loading, which ensures that each construct has a clear distinction from the other. Furthermore, the reliability of the construct was evaluated through Cronbach's Alpha and Composite Reliability (CR), with a value of ≥ 0.70 as a condition that the indicators have good internal consistency. After the measurement model is declared valid and reliable, the analysis is continued on the inner model to assess the relationship between constructs through the path coefficient, R-square value, and Adjusted R^2. The significance test of the influence between variables was carried out by the bootstrapping method (5000 resampling), where an influence is considered significant if the t-statistical value > 1.96 and the p-value < 0.05. With the fulfillment of these criteria, the research hypothesis is declared accepted.

Results and Discussion

Measurement Model Evaluation (*Outer Model)*

The evaluation of the measurement model was carried out through testing of convergent validity, discriminant validity, and construct reliability. This test aims to ensure that the indicators used are able to measure research constructs accurately and consistently.

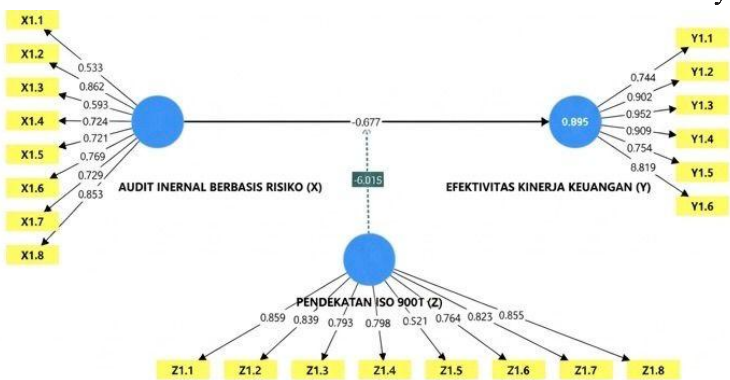

Figure 1. PLS-SEM Measurement Model Research

The measurement model was evaluated by examining indicator reliability, internal consistency reliability, convergent validity, and discriminant validity. Internal consistency reliability was assessed using Cronbach's Alpha and Composite Reliability (CR), whereas convergent validity was evaluated using the Average Variance Extracted (AVE). As presented in Table 2, all constructs demonstrated satisfactory internal consistency reliability, with Cronbach's Alpha values ranging from 0.882 to 0.942 and Composite Reliability values exceeding the recommended threshold of 0.70. Likewise, the AVE values ranged from 0.557 to 0.715, indicating that each construct explained more than 50% of the variance of its indicators. These findings suggest that the measurement model achieved acceptable reliability and convergent validity.

Discriminant Validity

Tabel 2. Results of the Discriminant Validity Test

Variable	*Risk-Based Internal Audit (X)*	*Financial Performance Effectiveness (Y)*	*ISO 9001(Z) Approach*
Risk-Based Internal Audit (X)	0.746		
Financial Performance Effectiveness (Y)	0.905	0.833	
ISO 9001(Z) Approach	0.960	0.046	0.846

Discriminant validity was initially assessed using the Fornell–Larcker criterion. However, the results indicate that several constructs exhibit correlations higher than the square root of their respective AVE values. Specifically, the square root of AVE for Risk-Based Internal Audit (0.746) is lower than its correlations with Financial Performance Effectiveness (0.905) and ISO 9001 Implementation (0.960). Similarly, the square root of AVE for Financial Performance Effectiveness (0.833) is lower than its correlation with Risk-Based Internal Audit (0.905). These results indicate that discriminant validity has not been fully established according to the Fornell–Larcker criterion, suggesting a substantial overlap among the constructs. Therefore, the structural model should be interpreted cautiously because the conceptual distinction between Risk-Based Internal Audit and ISO 9001 implementation may not be sufficiently strong in the present sample.

Construct Reliability

Tabel 3. Construct Reliability Test Results

Variable	*Cronbach's alpha*	*Composite reliability (rho_a)*	*Composite reliability (rho_c)*	*Average Variance extracted (AVE)*
Risk-Based Internal Audit (X)	0.882	0.906	0.908	0.557

Variable	*Cronbach's alpha*	*Composite reliability (rho_a)*	*Composite reliability (rho_c)*	*Average Variance extracted (AVE)*
Financial Performance Effectiveness (Y)	0.911	0.925	0.931	0.694
ISO 9001(Z) Approach	0.942	0.948	0.952	0.715

The results of the construct reliability test in Table 3 show that all variables have very adequate internal consistency and convergent validity. This is indicated by Cronbach's Alpha values for the Risk-Based Internal Audit (X1), Financial Performance Effectiveness (Y), and ISO 9001 Approach (Z) constructs of 0.882, 0.911, and 0.942, respectively, all of which exceed the minimum threshold of 0.70. Furthermore, the Composite Reliability value for both rho_a and rho_c was recorded above 0.90 in all three constructs, indicating a very high level of stability and reliability in representing latent variables. The Average Variance Extracted (AVE) value in the range of 0.557 to 0.715 also shows that each construct is able to adequately explain the variance of the indicator, which is more than 50 percent. Thus, the entire construct can be declared reliable, has strong measurement capabilities, and meets the feasibility requirements to proceed to the structural model testing stage.

Structural Model Evaluation (*Inner Model)*

Coefficient of Determination (R2)

Tabel 4. Value of Determination Coefficient (R2)

Variable	*R-square*	*R-square Adjust*
Financial Performance Effectiveness (Y)	0.895	0.876

The structural model was evaluated using the coefficient of determination (R^2), effect size (f^2), and bootstrapping procedures. The model produced an R^2 value of 0.895, indicating that Risk-Based Internal Audit, ISO 9001 implementation, and their interaction jointly explained approximately 89.5% of the variance in Financial Performance Effectiveness. Although this value suggests a substantial level of explained variance, it should be interpreted cautiously because the relatively small sample size and the overlap between constructs may inflate the explanatory power of the model. Therefore, the high R^2 value should not automatically be interpreted as evidence of strong predictive capability.

The effect size analysis revealed considerable variation among the predictors. Risk-Based Internal Audit demonstrated a negligible effect on Financial Performance Effectiveness ($f^2 = 0.004$), whereas ISO 9001 implementation exhibited a relatively large effect ($f^2 = 0.640$). The interaction term between Risk-Based Internal Audit and ISO 9001 implementation produced only a very small effect ($f^2 = 0.005$), suggesting that the moderating effect was limited within the proposed model. Nevertheless, these effect sizes should be interpreted alongside the measurement model limitations, particularly the lack of adequate discriminant validity.

The structural model was further evaluated using bootstrapping with 5,000 resamples. The results indicate that Risk-Based Internal Audit did not have a statistically significant effect on Financial Performance Effectiveness ($\beta = -0.077$, $t = 0.185$, $p = 0.853$). Therefore, H1 was not supported. These findings suggest that, within the context of Perumda Tirtanadi, the implementation of Risk-Based Internal Audit alone was not associated with improvements in perceived Financial Performance Effectiveness.

ISO 9001 implementation demonstrated a statistically significant relationship with Financial Performance Effectiveness ($\beta = 1.021$, $t = 2.508$, $p = 0.012$), indicating support for H2. However, the standardized coefficient exceeded the commonly expected range, which may reflect multicollinearity or suppression effects arising from the high correlation between the independent constructs. Consequently, the magnitude of this coefficient should be interpreted cautiously until additional collinearity diagnostics are conducted. The moderating effect of ISO 9001 implementation on the relationship between Risk-Based Internal Audit and Financial Performance Effectiveness was not statistically significant ($\beta = -0.018$, $t = 0.310$, $p = 0.757$). Accordingly, H3 was not supported. The results indicate that ISO 9001 implementation did not significantly strengthen or weaken the relationship between Risk-Based Internal Audit and Financial Performance Effectiveness within the observed sample.

Discussion

The findings indicate that Risk-Based Internal Audit was not significantly associated with Financial Performance Effectiveness. This result differs from several previous studies reporting positive relationships between risk-based auditing and organizational performance. One possible explanation is that the contribution of Risk-Based Internal Audit may depend not only on the quality of the audit process itself but also on the effectiveness of management in implementing audit recommendations. In addition, the relatively small sample size and the perception-based measurement adopted in this study may have limited the ability to detect statistically significant effects (Bachren & Trisninawati, 2025; Azhari & Waluyowati, 2023)

Meanwhile, the results of the study stating that Risk-Based Internal Audits do not have a significant effect on the effectiveness of financial performance are in line with some previous studies that emphasized that risk-based audits play more of a role in strengthening internal controls, improving compliance, and mitigating risks. The impact on financial performance is generally indirect because it is highly dependent on the quality of the follow-up of audit recommendations and their integration in the managerial decision-making process. Research by Nurnaningsih in 2024 revealed that risk-based audits do not affect financial performance if audit recommendations are not adequately followed. In addition, research by Gunarsih & Romli in 2025 states that internal audits will only make a significant contribution to financial performance if audit results are implemented consistently and followed by operational improvements.

The study also found a significant association between ISO 9001 implementation and Financial Performance Effectiveness. From a theoretical perspective, ISO 9001 promotes standardized procedures, continuous improvement, process consistency, and customer-focused management, which may contribute to more effective organizational performance. Nevertheless, the standardized path coefficient exceeding one ($\beta = 1.021$) and the very high correlation between Risk-Based Internal Audit and ISO 9001 implementation suggest the possibility of multicollinearity or suppression effects. Therefore, this result should not be interpreted as conclusive evidence that ISO 9001 alone substantially improves Financial Performance Effectiveness. Instead, the finding should be viewed as preliminary evidence requiring confirmation through larger samples and additional diagnostic testing.

Furthermore, ISO 9001 implementation did not significantly moderate the relationship between Risk-Based Internal Audit and Financial Performance Effectiveness. Rather than concluding that integration between the two systems is ineffective, this result may indicate that the moderating effect was too small to be detected within the present sample or that both constructs were perceived by respondents as representing similar organizational governance practices. The absence of a significant interaction effect may also reflect the limited statistical power associated with the relatively small sample size and the cross-sectional nature of the research design.

This study contributes to the literature by simultaneously examining Risk-Based Internal Audit, ISO 9001 implementation, and Financial Performance Effectiveness within the context of a regional-owned water utility. Although the findings provide initial empirical evidence regarding the relationships among these constructs, they should be interpreted as exploratory rather than confirmatory because of the limited sample size, perception-based measurements, and the measurement model limitations identified during discriminant validity assessment. Future research is therefore encouraged to employ larger samples, incorporate objective financial indicators, assess common method bias and multicollinearity more comprehensively, and further validate the conceptual distinction between Risk-Based Internal Audit and ISO 9001 implementation before drawing stronger theoretical conclusions.

Conclusion

Based on the results of the analysis and discussion of the research, it can be concluded that the ISO 9001 approach has been proven to have a positive and significant influence on the effectiveness of Perumda Tirtanadi's financial performance. The implementation of this quality management standard is able to improve process consistency, operational efficiency, and organizational ability to manage costs and resources, thus having a direct impact on improving the effectiveness of financial performance. In contrast, Risk-Based Internal Audits do not have a significant impact on the effectiveness of financial performance. This shows that risk-based audits function more as a mechanism for monitoring and mitigating risks that have an indirect impact on financial performance, especially if audit recommendations are not followed up optimally. In addition, the ISO 9001 approach is not able to moderate the relationship between Risk-Based Internal Audits and the effectiveness of financial performance, indicating that the integration between the two systems has not been maximized in organizational practices. Overall, this study shows that improving the financial performance of public organizations such as Perumda Tirtanadi depends more on the effectiveness of the implementation of quality management standards than on the implementation of risk-based audits alone. Thus, strengthening the organizational quality system and increasing operational consistency is a more strategic aspect in supporting the achievement of sustainable financial performance effectiveness.

Declarations

Statement on the Use of Artificial Intelligence. Declares whether or not AI was used in the article.

Author contribution statement. Describes the contribution of each author to the conduct of the research and the preparation of the article, in accordance with the conventions of the specific field of study.

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