

# Economic and Business Horizon

ISSN: 2963-2765

## Economic and Business Horizon

Volume: 05

Issue: 02

Year: 2026

Page: 177-188

### Citation:

Rachman, H. A, Salisa, M. R, & Kuncoro, F. D. (2026). The Effect of kaizen, lean accounting, and six sigma on internal audit effectiveness with sbsc as moderator. *Economics and Business Horizon*, 5(2), 177-188.

## The Effect of Kaizen, Lean Accounting, and Six Sigma on Internal Audit Effectiveness with SBSC as Moderator

Helmy Aulia Rachman<sup>1\*</sup>, Meilenia Rahma Salisa<sup>2</sup>, Fajar Dwi Kuncoro<sup>3</sup>

<sup>1</sup> Universitas Brawijaya, Malang, Indonesia

<sup>2</sup> Universitas Pembangunan Nasional Veteran Jawa Timur, Surabaya, Indonesia

<sup>3</sup> Politeknik Perkapalan Negeri Surabaya, Surabaya, Indonesia

\* Corresponding author: Helmy Aulia Rachman ([helmy.aulia@ub.ac.id](mailto:helmy.aulia@ub.ac.id))

### Abstract

This study investigates the effectiveness of internal audit functions in state-owned enterprises particularly in addressing ongoing fraud issues and deficiencies in internal control systems. The primary objective is to empirically evaluate the impact of kaizen, lean accounting, and six sigma on internal audit effectiveness, while incorporating the Sustainability Balanced Scorecard (SBSC) as a moderating variable. The research adopts a quantitative explanatory approach, utilizing purposive sampling to obtain data from 100 employees within State-Owned Enterprises. The analysis is conducted using Moderated Regression Analysis (MRA) with SPSS software. The results indicate that kaizen, lean accounting, and six sigma each exert a positive and statistically significant influence on internal audit effectiveness. Among these approaches, six sigma emerges as the most influential factor, as reflected by its highest coefficient and level of significance. In addition, SBSC is found to significantly enhance the relationships between the independent variables and internal audit effectiveness, underscoring its role in strengthening sustainability-based performance evaluation. The findings highlight that the integration of continuous improvement practices with sustainability-oriented frameworks can enhance the quality and effectiveness of internal audits.

### Keywords

Internal Audit Effectiveness, Kaizen, Lean Accounting, Six Sigma, Sustainability Balanced Scorecard.

## 1. Introduction

Internal audit is a critical function within organizations as it assists management in reviewing financial statements to ensure the effectiveness of internal controls and to prevent accounting fraud (Salma, 2022). It is generally carried out through systematic examination and evaluation of company policies, procedures, and operational activities to ensure compliance with applicable regulations (Wahyuni et al., 2024). However, despite its importance, fraud remains a persistent issue in various organizations, including State-Owned Enterprises (*Badan Usaha Milik Negara/BUMN*). Based on survey data from the Association of Certified Fraud Examiners (ACFE) Indonesia, fraud cases in Indonesia have resulted in losses of up to IDR 873 billion (ACFE Indonesia, 2019). As shown in Figure 1, 23.4% of respondents indicated that internal audit plays a role in fraud detection, ranking second after media reporting, while 9.6% identified other audit-related mechanisms contributing to fraud detection. These findings suggest that audit functions, particularly internal audit, play a crucial role in detecting and mitigating fraud.

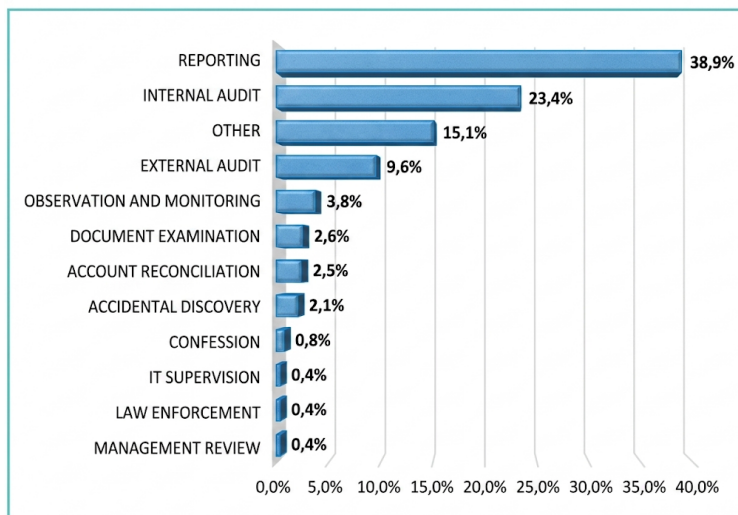


Figure 1. Fraud Detection Trends in Indonesia

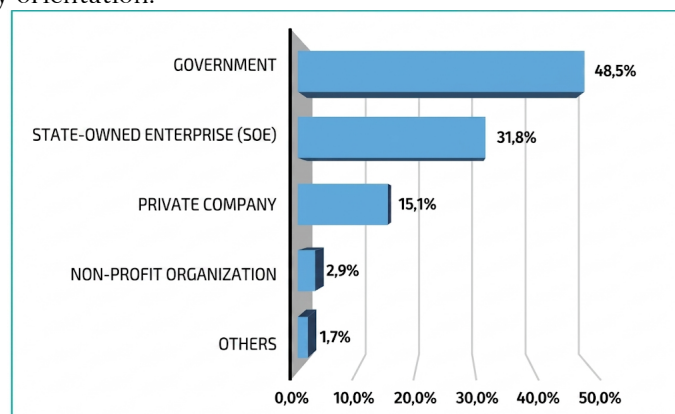
Nevertheless, several major fraud cases indicate that internal audit effectiveness remains suboptimal. One recent case occurred at Indofarma, part of the Biofarma group, where audit findings revealed fictitious transactions, misuse of deposit funds under personal names in cooperatives, procurement without feasibility studies, sales without customer financial analysis, and involvement in online lending activities. These irregularities resulted in an indicated loss of IDR 294.77 billion and a potential loss of IDR 164.83 billion (CNBC Indonesia, 2024). Another major case occurred at PT Timah TBK involving alleged corruption in tin commodity trading within mining concession areas during 2015–2022 through illegal cooperation with private parties (Detikcom, 2024). This case potentially caused state losses of up to IDR 271 trillion. These incidents were driven by weak governance, limited monitoring, and abuse of authority, highlighting the importance of strengthening internal audit systems.

To address these issues, organizations require effective managerial approaches to improve internal audit performance. One such approach is kaizen, a philosophy of continuous improvement derived from Japanese organizational culture that emphasizes quality, employee involvement, communication, and incremental change through Plan-Do-Check-Act (DCA) and Standardize-Do-Check-Act (SDCA) cycles (Imai, 1996). Kaizen supports internal audit by fostering continuous improvement,

enabling auditors to identify problems more quickly and enhance internal control systems over time.

In addition, lean accounting contributes to improving internal audit effectiveness by eliminating waste and enhancing value creation. It supports lean manufacturing by utilizing fewer resources such as time, labor, and space while maximizing efficiency (Kanivia et al., 2024). Lean accounting integrates lean principles into financial reporting, cost management, and performance measurement systems, thereby supporting more transparent and efficient audit processes (Ditkaew, 2022). Meanwhile, six sigma focuses on reducing defects and process variation through the structured DMAIC methodology, which enhances audit quality, decision-making, and organizational performance (Hendricks & Kelbaugh, 1998; Kwak & Anbari, 2006; Setijono et al., 2012).

Although prior studies have examined these approaches individually, limited research has simultaneously integrated kaizen, lean accounting, and six sigma in explaining internal audit effectiveness, particularly in BUMN organizations. Moreover, the role of sustainability-oriented performance systems in this relationship remains underexplored. Therefore, this study introduces the Sustainability Balanced Scorecard (SBSC) as a moderating variable. SBSC extends the traditional balanced scorecard by incorporating environmental, social, and ethical dimensions alongside financial and non-financial indicators (Hansen & Schaltegger, 2016). SBSC is expected to strengthen internal audit effectiveness by broadening performance evaluation and improving transparency, accountability, and sustainability orientation.



**Figure 2.** Distribution of Organizations Most Affected by Fraud Cases

This study is also motivated by evidence showing that BUMN entities are among the most affected by fraud, accounting for 31.8% of fraud-related losses after government institutions, as shown in Figure 2. This condition is reinforced by the high visibility of fraud cases in state-owned enterprises, particularly during politically sensitive periods such as 2024. Therefore, this study aims to empirically examine the effect of kaizen, lean accounting, and six sigma on internal audit effectiveness in BUMN, with SBSC as a moderating variable. The novelty of this research lies in integrating three continuous improvement methodologies with sustainability-based performance measurement to enhance internal audit effectiveness and strengthen fraud mitigation in state-owned enterprises.

## **2. Literature Review**

### ***2.1. The Influence of Kaizen on Internal Audit Effectiveness***

Kaizen is recognized as a management philosophy centered on continuous improvement that engages all levels of an organization, from top management to operational employees. This approach combines managerial concepts, systems, and

tools within a broader leadership structure influenced by organizational culture and customer-focused objectives (Singh & Singh, 2009). The fundamental principle of kaizen emphasizes gradual and consistent improvements in organizational activities to enhance operational performance. A key component of this approach is the PDCA cycle, which was initially developed by Shewhart in the 1920s and later refined by Deming into the PDCA framework (Watson, 1986). This cycle consists of four interconnected stages: planning improvements, implementing actions, assessing results, and applying corrective measures to optimize processes. Such a structured framework enables organizations to maintain sustainable performance improvement and effective problem resolution.

The application of kaizen has the potential to improve internal audit effectiveness by encouraging a culture of continuous development, teamwork, and operational efficiency. This approach allows internal auditors to detect issues more efficiently, develop practical solutions, and ensure the ongoing enhancement of internal control systems. Previous studies have demonstrated the positive contribution of kaizen to internal audit performance and organizational control effectiveness (Kober et al., 2012; Sahri & Novita, 2019; Sofyani, 2023). Therefore, kaizen can be considered a strategic method for strengthening internal audit functions and enhancing organizational accountability.

H1: Kaizen implementation has a positive effect on internal audit effectiveness.

### ***2.2. The Influence of Lean Accounting on Internal Audit Effectiveness***

Lean philosophy emphasizes the elimination of waste throughout organizational processes while maximizing value creation for customers. Within this framework, accountants are expected to deliver timely feedback through simplified procedures and implement value-driven approaches that support operational efficiency (Ali et al., 2021). Lean accounting serves as a strategic approach that aligns accounting systems with lean principles by producing financial information that is clear, concise, and easily understandable. This approach reflects the principles of continuous improvement and waste reduction that are central to lean philosophy (McVay et al., 2013). According to DeBusk (2012), managers require financial information that is aligned with lean principles in order to optimize value stream performance and improve organizational decision-making. Therefore, management accountants play a crucial role in supporting lean implementation by providing appropriate tools and relevant financial information for effective value stream management.

The implementation of lean accounting contributes significantly to internal audit effectiveness by streamlining operational processes, enhancing transparency, reducing inefficiencies, and improving the reliability and relevance of financial information. This enables internal auditors to conduct audit procedures more efficiently, prioritize critical risk areas, and provide more valuable recommendations for continuous improvement. Several previous studies have confirmed the positive relationship between lean accounting and internal audit performance (Haskin & Haskin, 2014; Ditkaew, 2022; Abdulmir & Chouaibi, 2023).

H2: Lean accounting implementation has a positive effect on internal audit effectiveness.

### ***2.3. The Influence of Six Sigma on Internal Audit Effectiveness***

Six sigma is recognized as a structured methodology for continuous improvement that is implemented through five systematic stages: Define, Measure, Analyze, Improve, and Control (DMAIC). This data-driven approach is designed to improve organizational performance by identifying customer needs and minimizing defects

or errors in both manufacturing and service processes, ultimately enhancing customer satisfaction (Shaheen & Ahmed, 2017). The successful implementation of six sigma requires organizations to possess comprehensive knowledge of six sigma tools, statistical techniques, and practical problem-solving methods (Al-Zabari & Al-Fatlawi, 2019). In addition, continuous employee training and hands-on learning are essential to ensure effective execution and maintain high standards of quality across organizational processes (Mustafa & Jamaluddin, 2017; Ghaleb & Abdulahad, 2022).

The application of six sigma can significantly improve internal audit effectiveness by increasing audit quality, enhancing process efficiency, and improving stakeholder satisfaction. This methodology encourages a culture of continuous improvement, where internal audit functions not only focus on identifying operational issues but also contribute to long-term corrective actions and sustainable organizational improvements. Previous empirical studies have consistently demonstrated the positive relationship between six sigma implementation and internal audit effectiveness (Hafez, 2015; Shaheen & Ahmed, 2017; Alwi, 2023; Asnaashari & Khodabandehlou, 2023).

H3: Six sigma implementation has a positive effect on internal audit effectiveness.

#### ***2.4. Sustainability Balanced Scorecard as a Moderating Variable***

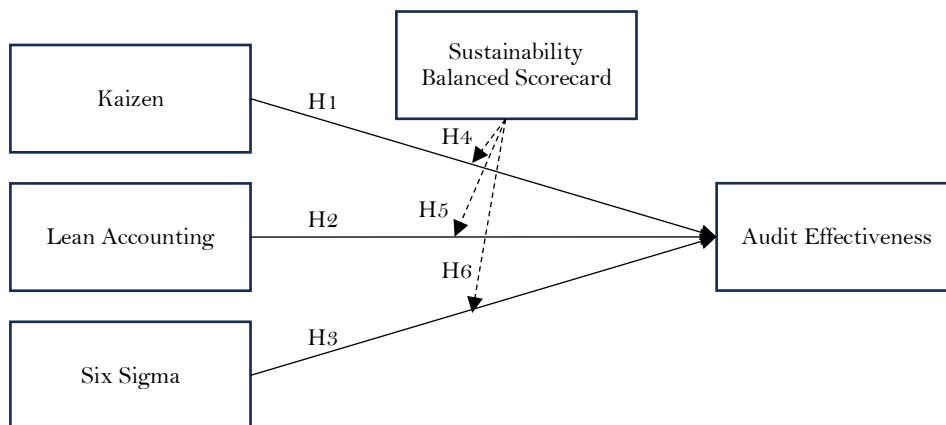
The Sustainability Balanced Scorecard (SBSC) is recognized as a strategic management system that incorporates environmental and social performance dimensions into the traditional Balanced Scorecard framework. This approach broadens the conventional model by integrating sustainability-oriented objectives, allowing organizations to assess performance more comprehensively. The adoption of sustainability practices enables organizations to strengthen social legitimacy while improving long-term financial outcomes (Gunawan & Utami, 2016). In addition, greater transparency, alignment between organizational strategy and operations, and stronger corporate accountability can help minimize risks and progressively enhance profitability (Mwelu et al., 2014). In business environments characterized by high uncertainty and complexity, SBSC serves as an essential management instrument for improving the efficiency and performance of internal audit functions (Chan et al., 2021).

The use of SBSC can improve the implementation of internal audit and increase the effectiveness of internal control systems by fostering transparency, strengthening risk management, ensuring regulatory compliance, and promoting stakeholder involvement. This framework ensures that organizational performance measurement extends beyond financial indicators by incorporating ethical, environmental, and social responsibilities. Furthermore, the Balanced Scorecard framework supports better strategic communication and enhances both organizational efficiency and operational effectiveness (Hafez, 2015). Previous studies have highlighted the significant role of SBSC in improving organizational sustainability and overall performance (Gazi et al., 2022; Sabir & Mahmood, 2023; dos-Santos et al., 2023). Therefore, this study positions SBSC as a moderating variable to reinforce the relationship between kaizen, lean accounting, six sigma, and internal audit effectiveness.

H4: SBSC strengthens the relationship between kaizen and internal audit effectiveness.

H5: SBSC strengthens the relationship between lean accounting and internal audit effectiveness.

H6: SBSC strengthens the relationship between six sigma and internal audit effectiveness.



**Figure 1.** Research Framework

Figure 3 presents the conceptual framework of this study, which is designed to test the direct and moderating hypotheses developed in the literature review. The framework consists of three independent variables: Kaizen, Lean Accounting, and Six Sigma, and one dependent variable: Internal Audit Effectiveness. The Sustainability Balanced Scorecard (SBSC) serves as the moderating variable. The direct relationships (H1, H2, H3) indicate the positive effects of each independent variable on internal audit effectiveness. Meanwhile, the interaction paths (H4, H5, H6) illustrate how SBSC strengthens the influence of Kaizen, Lean Accounting, and Six Sigma on internal audit effectiveness.

### 3. Methods

This research conducts a quantitative analysis using an explanatory research design to investigate the impact of kaizen, lean accounting, and six sigma on the effectiveness of internal audits, while also evaluating the moderating influence of the Sustainability Balanced Scorecard (SBSC). A quantitative method is used as it allows for objective assessment of connections between variables utilizing numerical data examined through statistical methods. The study aims to evaluate hypotheses to clarify the causal links among independent variables, the dependent variable, and the moderating variable in the framework of BUMN.

The population of this study consists of employees of BUMN in 2024. This population is selected due to the relevance of employees' roles in the implementation of management systems and internal audit processes within organizations. The method employed is purposive sampling, which entails choosing participants according to predetermined criteria pertinent to the research goals. Using Slovin's formula, the final sample size is calculated to be 100 respondents, who are deemed representative of the population being examined.

The variables in this study consist of dependent, independent, and moderating variables. The dependent variable is internal audit effectiveness, which is measured through the ability of internal audit to provide risk control recommendations, evaluate risk management systems, and add value to overall audit processes. The independent variables include kaizen, lean accounting, and six sigma. Kaizen is measured through indicators such as continuous improvement, process efficiency, waste reduction, and organizational productivity enhancement. Lean accounting is measured through the availability of accurate accounting information, cost control, reporting efficiency, and support for decision-making and continuous operational improvement. Six sigma is measured through indicators such as management commitment, use of statistical data, structured teamwork, and systematic problem-solving capabilities.

The moderating variable in this study is SBSC, which is used to strengthen the relationship between the independent variables and internal audit effectiveness. SBSC is measured through indicators of cost efficiency, employee welfare, and corporate reputation from a customer perspective. The SBSC framework integrates environmental, social, and sustainability dimensions into organizational performance measurement, providing a more comprehensive evaluation of internal audit effectiveness.

Data gathering was carried out through questionnaires given to participants who fulfilled the research requirements. Every statement in the survey was assessed using a five-point Likert scale that varied from strongly agree (5), agree (4), neutral (3), disagree (2), to strongly disagree (1). The gathered data were subsequently examined using Statistical Product and Service Solutions (SPSS) version 25. The technique used for data analysis is Moderated Regression Analysis (MRA) to investigate both direct and interaction effects between variables. T-tests were utilized for hypothesis testing to analyze partial effects, while F-tests were employed to determine simultaneous effects in the model. The regression model applied in this research is  $Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_1Z + b_5X_2Z + b_6X_3Z$ , where Y signifies internal audit effectiveness, X1 stands for kaizen, X2 denotes lean accounting, X3 indicates six sigma, Z represents SBSC, a is the constant, and b symbolizes the regression coefficients.

#### 4. Results

Before conducting hypothesis testing, this study first performed classical assumption tests to ensure the appropriateness of the regression model. One of the tests applied was the normality test, which aimed to determine whether the residuals in the regression model were normally distributed. The results of the normality test are presented in the following Figure 3.

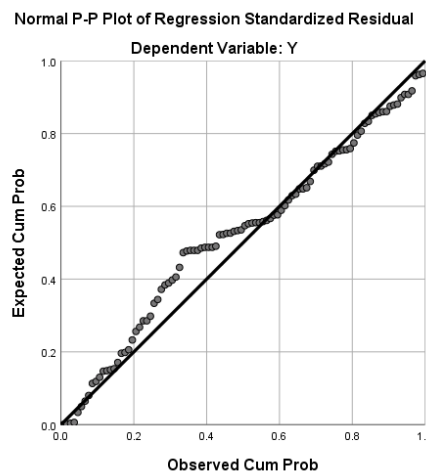


Figure 3. P-P Plot

Based on Figure 3, it can be observed that the resulting pattern forms a diagonal straight line, and the data points are scattered around and follow the direction of the diagonal line. Therefore, it can be concluded that the residuals are normally distributed.

Table 1. Multicollinearity Test Results

Variable	Collinearity Tolerance	Statistics VIF
Kaizen	0.409	2.447
Lean Accounting	0.587	1.704
Six Sigma	0.424	2.358

According to Table 1, the results of the multicollinearity test show that all independent variables, specifically kaizen, lean accounting, and six sigma, possess tolerance values exceeding 0.10 and Variance Inflation Factor (VIF) values under 10. Kaizen exhibits a tolerance value of 0.409 and a VIF of 2.447; lean accounting shows a tolerance value of 0.587 and a VIF of 1.704, whereas six sigma has a tolerance value of 0.424 and a VIF of 2.358. These findings show that there are no signs of multicollinearity among the independent variables, suggesting that the regression model is suitable for additional analysis

**Table 2.** Heteroscedasticity Test Result

<b>Variable</b>	<b>Unstandardized B</b>	<b>Std. Error</b>	<b>Standardized Beta</b>	<b>t</b>	<b>Sig.</b>
Kaizen	-0.012	0.023	-0.081	-0.519	0.605
Lean Accounting	0.021	0.011	0.238	1.817	0.702
Six Sigma	-0.023	0.025	-0.140	-0.910	0.365

Table 2 shows that the heteroscedasticity test results reveal all independent variables, namely kaizen, lean accounting, and six sigma, have significance values greater than 0.05. Kaizen has a significance value of 0.605, lean accounting shows a significance value of 0.702, and six sigma displays a significance value of 0.365. These results indicate that the regression model shows no signs of a heteroscedasticity problem. As a result, the data meets the homoscedasticity assumption, rendering the regression model appropriate for further analysis.

**Table 3.** F-Test Results

<b>Model</b>	<b>Sum of Squares</b>	<b>df</b>	<b>Mean Square</b>	<b>F</b>	<b>Sig.</b>
Regression	1039.867	3	346.622	134.002	0.000
Residual	248.323	96	2.587		
Total	1288.190	99			

According to Table 3, the F-test findings reveal that the computed F-value is 134.002, and the significance level is 0.000. Because the p-value is below 0.05, we can infer that the regression model is statistically significant at the same time. This discovery reveals that kaizen, lean accounting, and six sigma together significantly influence the efficiency of internal audits. The regression model is viewed as suitable for additional examination.

**Table 4.** Direct Effect

<b>Variable</b>	<b>Unstandardized B</b>	<b>Std. Error</b>	<b>Standardized Beta</b>	<b>t</b>	<b>Sig.</b>
Kaizen → Internal Audit Effectiveness	0.203	0.035	0.409	5.841	0.000
Lean Accounting → Internal Audit Effectiveness	0.055	0.017	0.187	3.199	0.002
Six Sigma → Internal Audit Effectiveness	0.224	0.037	0.413	6.003	0.000

According to Table 4, the direct effect findings show that every independent variable positively and significantly influences internal audit effectiveness. Kaizen demonstrates a beneficial impact with a coefficient of 0.203, a t-value of 5.841, and a significance level of 0.000, indicating that the adoption of kaizen markedly improves

internal audit efficiency. Likewise, lean accounting shows a favorable and substantial impact, presenting a coefficient of 0.055, a t-value of 3.199, and a significance value of 0.002, highlighting its role in enhancing audit performance. Additionally, six sigma shows the most significant impact among the variables, holding a coefficient of 0.224, a t-value of 6.003, and a significance level of 0.000. These results affirm that kaizen, lean accounting, and six sigma each contribute substantially to enhancing internal audit effectiveness, with six sigma exhibiting the strongest impact

**Table 5.** MRA

<b>Variable</b>	<b>Unstandardized B</b>	<b>Std. Error</b>	<b>Standardized Beta</b>	<b>t</b>	<b>Sig.</b>
Kaizen	0.040	0.058	0.080	0.687	0.494
SBSC	0.379	0.114	0.391	3.323	0.001
Kaizen*SBSC	0.012	0.005	0.500	2.496	0.014
Lean Accounting	-0.014	0.034	-0.047	-0.404	0.687
SBSC	0.499	0.105	0.516	4.760	0.000
Lean Acc*SBSC	0.007	0.003	0.489	2.631	0.010
Six Sigma	0.027	0.067	0.051	0.409	0.683
SBSC	0.404	0.093	0.418	4.339	0.000
Six Sigma*SBSC	0.015	0.005	0.517	2.744	0.007

Table 5 shows that the results from the Moderated Regression Analysis (MRA) reveal that the interaction terms with the independent variables and the Sustainability Balanced Scorecard (SBSC) are both positive and statistically significant, indicating a moderating effect. Although the direct effects of kaizen, lean accounting, and six sigma become statistically insignificant with the moderator (sig. > 0.05), the interaction terms kaizen\*SBSC (B = 0.012; sig. = 0.014), lean accounting\*SBSC (B = 0.007; sig. = 0.010), and six sigma\*SBSC (B = 0.015; sig. = 0.007) continue to be significant at the 5% level. This suggests that sbcs improves the relationships among all independent variables and the efficiency of internal audits. Moreover, the sbcs variable continually shows a positive and significant coefficient across the models, highlighting its essential importance in enhancing audit effectiveness. In conclusion, these findings indicate that sbcs functions as a positive moderator, boosting the advantageous effects of kaizen, lean accounting, and six sigma on the efficiency of internal audits

### 5. Discussion

The findings of this study demonstrate that the hypothesis proposing a positive effect of kaizen on internal audit effectiveness is supported. This result is in line with earlier studies conducted by Kober et al. (2012), Sahri and Novita (2019), and Sofyani (2023), which consistently highlight the beneficial impact of kaizen on internal audit practices. These findings suggest that the implementation of kaizen, particularly through the Plan–Do–Check–Act cycle, contributes to improving internal audit effectiveness by fostering a work environment that emphasizes continuous improvement, collaboration, and operational efficiency. As a result, internal auditors are better equipped to identify issues promptly, formulate appropriate solutions, and ensure that internal control systems are continuously enhanced.

Furthermore, the results confirm that lean accounting has a positive and significant influence on internal audit effectiveness. This outcome is consistent with prior empirical evidence presented by Haskin and Haskin (2014), Ditkaew (2022), and Abdulmir and Chouaibi (2023), which demonstrates the relevance of lean accounting in improving audit-related functions. Lean accounting enhances internal audit effectiveness by simplifying organizational processes, increasing transparency,

reducing unnecessary activities, and ensuring that financial information is accurate and relevant. These improvements enable internal auditors to perform their duties more efficiently, concentrate on high-risk areas, and provide more meaningful recommendations that support continuous organizational improvement.

In addition, the study reveals that six sigma has a significant positive effect on internal audit effectiveness. This finding is supported by previous research conducted by Hafez (2015), Shaheen and Ahmed (2017), Alwi (2023), and Asnaashari and Khodabandehlou (2023), all of which report the effectiveness of six sigma in enhancing audit quality and organizational performance. The application of six sigma promotes a systematic approach to continuous improvement, ensuring that internal audit functions extend beyond problem identification to include long-term process improvement and quality enhancement. Six sigma strengthens the role of internal audit in supporting organizational effectiveness and sustainability.

Moreover, the findings indicate that the Sustainability Balanced Scorecard (SBSC) significantly moderates the relationship between kaizen and internal audit effectiveness. This result aligns with prior studies by Gazi et al. (2022), Sabir and Mahmood (2023), and dos-Santos et al. (2023), which emphasize the importance of sustainability-oriented performance frameworks. The presence of SBSC strengthens this relationship by providing a comprehensive and integrated framework for performance measurement and reporting. This integration ensures that audit processes not only focus on efficiency and effectiveness but also incorporate sustainability considerations, thereby enhancing the overall quality and relevance of internal audit activities.

Similarly, SBSC is found to strengthen the relationship between lean accounting and internal audit effectiveness. By integrating sustainability dimensions into accounting and auditing processes, SBSC enhances transparency, accountability, and operational efficiency. This finding further supports the role of SBSC as a strategic tool that improves the alignment between organizational objectives and audit practices. The integration of SBSC within lean accounting contributes to more effective internal audit processes and promotes sustainable organizational performance.

Finally, the results confirm that SBSC also strengthens the relationship between six sigma and internal audit effectiveness. This finding is consistent with studies by Gazi et al. (2022), Sabir and Mahmood (2023), and dos-Santos et al. (2023), as well as the argument proposed by Gupta (2004), which emphasizes the importance of goal setting, data-driven analysis, and continuous improvement in achieving organizational effectiveness. These findings indicate that operational effectiveness is achieved not only at the strategic level but also across all levels of the organization. Therefore, the integration of six sigma and the balanced scorecard framework enhances the effectiveness and efficiency of internal audit, particularly in environments characterized by increasing risk management demands, where the role of internal audit becomes increasingly critical.

## 6. Conclusion

Based on the research findings and hypothesis testing, it can be concluded that kaizen, lean accounting, and six sigma have a positive and significant effect on internal audit effectiveness. In addition, the Sustainability Balanced Scorecard (SBSC) is proven to strengthen the relationship between these variables and internal audit effectiveness. Among the three approaches, six sigma demonstrates the most dominant influence, as indicated by its highest coefficient and level of significance. These results suggest that continuous improvement and efficiency-oriented management practices play a crucial role in enhancing the quality and performance of internal audit, particularly within state-owned enterprises.

From a theoretical perspective, this study contributes to the development of internal audit literature by integrating kaizen, lean accounting, and six sigma within a single framework, supported by SBSC as a moderating variable. Practically, the findings highlight the importance for organizations to adopt sustainability-oriented management approaches in order to strengthen internal control systems and mitigate fraud risk. However, this study is subject to several limitations, including a relatively limited sample size and the use of a survey method that relies on respondents' perceptions. Therefore, future research is recommended to expand the sample scope, apply longitudinal approaches, and incorporate additional variables such as audit technology or organizational culture to provide more comprehensive insights.

## References

- Abdulmir, O. K., & Chouaibi, J. (2023). The role of the psychology of lean accounting principles in enhancing the reliability of financial statements. *Revista Iberoamericana de Psicología del Ejercicio y el Deporte*, 18(5), 537–542.
- Al-Zabari, S. A. H., & Al-Fatlawi, A. K. H. (2019). Internal audit performance and corporate governance quality. *Opción: Revista de Ciencias Humanas y Sociales*, 35(89), 2337–2365.
- Ali, S. B., Khan, Z. S., & Shah, Z. A. (2021). Lean accounting system: Importance and successful implementation. *Journal of Contemporary Issues in Business and Government*, 27(3), 300–310.
- Alwi, M. (2023). The use of continuous audit to improve the effectiveness and efficiency of internal audit activities: A practical study of distribution sharia company in Indonesia. *IQTISHODUNA: Jurnal Ekonomi Islam*, 12(2), 603–622.
- ACFE Indonesia. (2019). *Survei fraud Indonesia 2019*. Retrieved on March 1, 2026, from <https://acfe-indonesia.or.id/wp-content/uploads/2021/02/SURVEI-FRAUD-INDONESIA-2019.pdf>
- Chan, S. H., Creel, T. S., Song, Q., & Yurova, Y. V. (2021). Does CSR reporting indicate strong corporate governance? *International Journal of Accounting and Information Management*, 29(1), 27–42.
- CNBC Indonesia. (2024). *Selain fraud, Indofarma (INAF) terjerat pinjol dan jual beli fiktif*. Retrieved on December 30, 2025, from <https://www.cnbcindonesia.com/market/20240607101651-17-544674/selain-fraud-indofarma--inaf--terjerat-pinjol-dan-jual-beli-fiktif>.
- Debusk, G. K. (2012). Use lean accounting to add value to the organization. *Journal of Corporate Accounting & Finance*, 23(3), 35–41.
- Detikcom, T. (2024). *Memahami kasus korupsi timah yang timbulkan kerugian lingkungan Rp 271 T*. Retrieved on December 30, 2025, from <https://news.detik.com/berita/d-7271875/memahami-kasus-korupsi-timahyang-timbulkan-kerugian-lingkungan-rp-271-t>.
- Ditkaew, K. (2022). The effect of lean accounting implementation on organizational performance. *International Journal of Asian Business and Information Management*, 13(1), 1–18.
- Deming, W. E. (1995). *The new economics for industry, government and education* (2nd ed.). Cambridge: MIT Press.
- Gazi, F., Atan, T., & Kılıç, M. (2022). The assessment of internal indicators on the balanced scorecard measures of sustainability. *Sustainability (Switzerland)*, 14(14), 1–19.
- Ghaleb, G. S., & Abdulhad, A. F. (2022). The improving of internal auditing quality performance by the use of six sigma methodology standards: An applied study conducted at the general company for ports of Iraq. *Res Militaris*, 12(2), 5398–5412.
- Gunawan, B., & Utami, S. S. (2016). Peran corporate social responsibility dalam nilai perusahaan. *Riset Akuntansi dan Keuangan Indonesia*, 7(2), 174–185.
- Hafez, S. (2015). The integration of six sigma and balanced scorecard in internal auditing. *Research Journal of Finance and Accounting*, 6(18), 43–54.
- Hansen, E. G., & Schaltegger, S. (2016). The sustainability balanced scorecard: A systematic review of architectures. *Journal of Business Ethics*, 133(2), 193–221.

- Haskin, D. L., & Haskin, T. E. (2014). Evaluating service departments as value streams. *Journal of Business & Economics Research*, 12(2), 115–122.
- Hendricks, C. A., & Kelbaugh, R. L. (1998). Implementing six sigma at GE. *The Journal for Quality and Participation*, 21(4), 48–53.
- Imai, M. (1996). *Gemba kaizen*. Jakarta Pusat: PT Pustaka Binaman Pressindo.
- Kanivia, A., Supriyadi, A., Putrie, N. A., & Puspita, B. B. (2024). Implementasi lean accounting pada perusahaan industri. *Jurnal Ekonomi, Bisnis, dan Industri*, 6(1), 27–32.
- Kober, R., Subraamanniam, T., & Watson, J. (2012). The impact of total quality management adoption on small and medium enterprises' financial performance. *Accounting and Finance*, 52(2), 421–438.
- Kwak, Y. H., & Anbari, F. T. (2006). Benefits, obstacles, and future of six sigma approach. *Technovation*, 26(5–6), 708–715.
- McVay, G., Kennedy, F., & Fullerton, R. (2013). *Accounting in the lean enterprise*. Milton Park: Taylor & Francis Group.
- Mustafa, Z., & Jamaluddin, Z. (2017, April). Six sigma critical success factors in manufacturing industries. In *AIP conference proceedings* (Vol. 1830, No. 1, p. 080020). New York: AIP Publishing LLC.
- Mwelu, N., Rulangaranga, D. M., Watundu, S., Kaberuka, W., & Tindiwensi, C. K. (2014). Risk management and profitability of manufacturing firms in Uganda. *Risk Management*, 4(2), 200–210.
- Sabir, R. A., & Mahmood, S. (2023). The impact of sustainable balance scorecard to achieve competitive advantage in the Kurdistan region of Iraq economic unit. *Journal of University of Raparin*, 10(3), 750–781.
- Sahri, N. A., & Novita, N. (2019). Kaizen costing sebagai perbaikan berkelanjutan untuk meningkatkan keunggulan bersaing pada e-commerce. *Jurnal Kajian Akuntansi*, 3(1), 18–27.
- Salma, D. K. (2022). Masa depan peran audit internal di Indonesia. *Jurnal Akuntansi Multiparadigma*, 13(2), 277–293.
- Setijono, D., Laureani, A., & Antony, J. (2012). Critical success factors for the effective implementation of lean sigma. *International Journal of Lean Six Sigma*, 3(4), 274–283.
- Shaheen, M., & Ahmed, A. (2017). The role of the six sigma approach in controlling the quality of internal auditing in sports clubs. *Assiut Journal of Sport Science and Arts*, 4(417), 31–340.
- Singh, J., & Singh, H. (2009). Kaizen philosophy: A review of literature. *The ICFAI Journal of Operations Management*, 8(2), 51–73.
- Sofyani, H. (2023). Kaizen internal quality assurance adoption and quality performance improvement in Indonesian higher education institutions. *Journal of Accounting and Investment*, 24(3), 757–778.
- dos-Santos, L. C. T., Frimaio, A., Giannetti, B. F., Agostinho, F., Liu, G., & Almeida, C. M. (2023). Integrating environmental, social, and economic dimensions to monitor sustainability in the G20 countries. *Sustainability*, 15(8), 1–18.
- Wahyuni, A., Aini, N., Isnaini, P., Sholeha, P., Putri, R. A., Permatasari, Y., & Aliah, N. (2024). Peran audit internal terhadap kualitas laporan keuangan. *Jurnal Bisnis Mahasiswa*, 4(1), 78–87.
- Watson, M. (1986). *The Deming management method*. Los Angeles: Perigee Books.



Copyright: © 2026 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution-ShareAlike 4.0 International License (<https://creativecommons.org/licenses/by-sa/4.0/>).