

DESIGN AND DEVELOPMENT OF AN AI-BASED SMART ACCOUNTING SYSTEM FOR OPTIMIZING INTERNAL CONTROL PROCESS: A CASE STUDY AT PT DIWANGKARA WIHAYA NUSANTARA

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ABSTRACT

This study aims to design and develop an AI-based smart accounting system to optimize internal control processes within small and medium enterprises (SMEs), using PT Diwangkara Wihaya Nusantara as a case study. Employing a Design Science Research (DSR) approach, the study developed an artifact in the form of an AI-assisted accounting prototype. Data were collected through semi-structured interviews, direct observation, and document analysis involving accounting staff and managers, followed by performance evaluation through scenario simulations. The analysis compared manual accounting using Google Sheets with the AI-based system based on three indicators: journal entry processing time, classification error rate, and financial report compilation time. The findings showed a 71.1% reduction in processing time, an 82.9% decrease in journal classification errors, and a 66.1% improvement in reporting speed. Qualitative results further indicated increased accuracy, transparency, and managerial confidence in financial reporting. The study concludes that the proposed system strengthens both preventive and detective controls, in line with the COSO framework, and enhances decision-making efficiency. Future research is recommended to expand testing with larger datasets and integrate adaptive machine learning for predictive control and scalability.

Keywords: Artificial Intelligence; Internal Control; Accounting Information System; Design Science Research; SMEs

INTRODUCTION

Digital transformation has fundamentally reshaped organizational processes across industries, compelling firms to integrate technologies that enhance operational efficiency, data accuracy, transparency, and governance structures. The rapid evolution of digital tools, particularly Artificial Intelligence (AI), has not only transformed strategic decision-making but also redefined routine administrative functions such as accounting and financial management. In this evolving landscape, internal control systems remain essential to ensure the integrity, reliability, and credibility of financial information. Within the accounting domain, internal control serves as a structured framework designed to safeguard organizational assets, prevent fraud, ensure regulatory compliance, and support informed managerial decision-making. According to the Committee of Sponsoring Organizations of the Treadway Commission (COSO, 2013), control activities encompass both preventive mechanisms, which aim to avoid errors before they occur, and detective mechanisms, which are designed to identify irregularities or deviations after transactions have been processed. These dual mechanisms form a critical foundation for maintaining financial accountability in both large corporations and smaller business entities.

Despite their importance, the implementation of robust internal control systems remains a persistent challenge for small and medium enterprises (SMEs). SMEs frequently operate under significant constraints, including limited financial resources, inadequate technological infrastructure, and insufficient professional expertise in accounting and internal auditing (Fadjri & Hidayat, 2021). As a result, internal controls within SMEs often rely heavily on manual processes and informal supervision rather than structured, technology-driven control systems. At PT Diwangkara Wihaya Nusantara, for instance, accounting tasks were predominantly conducted using manual spreadsheet-based systems. While spreadsheets offer flexibility and low-cost accessibility, they also introduce substantial risks, including data inconsistencies, duplication of entries, formula errors, delayed reconciliation, and limited audit trails. Such vulnerabilities increase exposure to financial misstatements and reduce the reliability of financial reporting. Similar patterns have been observed among SMEs in developing economies, where internal control practices tend to remain procedural and compliance-oriented rather than strategically integrated into digital management systems (Musikavanhu & Nqala, 2024). Consequently, many SMEs struggle to transition from reactive error detection toward proactive risk prevention frameworks.

In response to these challenges, this study aimed to design and implement an AI-based accounting system capable of automating core financial processes while embedding structured internal control mechanisms aligned with COSO principles. The proposed system integrates automated journal entry generation, transaction verification, real-time validation, and financial statement preparation within a centralized digital platform. By incorporating rule-based validation algorithms and anomaly detection features, the system strengthens preventive and detective controls simultaneously. The primary objectives of this research were threefold: first, to systematically identify weaknesses and control gaps within the existing manual accounting procedures; second, to develop and prototype an AI-driven accounting system that directly addresses these weaknesses through automation and embedded control logic; and third, to evaluate the effectiveness of the implemented system in enhancing control reliability, operational efficiency, and reporting accuracy.

To achieve these objectives, the study employed an iterative prototyping methodology combined with performance simulations and controlled testing environments. The development process involved multiple design revisions, user feedback integration, and stress testing under simulated transaction volumes. Empirical evaluation demonstrated measurable improvements in processing speed, reduction in data-entry errors, enhanced traceability, and stronger compliance with internal control standards. These findings align with prior research indicating that AI-enabled financial systems can significantly improve organizational control environments and decision-support capabilities (Obaydin et al., 2023). Overall, the integration of AI into SME accounting practices not only modernizes financial operations but also transforms internal control from a reactive administrative function into a strategic governance mechanism capable of supporting sustainable organizational growth.

METHOD

This research adopted the Design Science Research (DSR) approach, which focuses on creating and evaluating artifacts that solve practical problems in accounting (Moradi et al., 2024). The study was conducted at PT Diwangkara Wihaya Nusantara between July and October 2025.

Development Procedure

A prototyping model was implemented through iterative stages:

1. Needs Analysis: Identified control weaknesses through interviews and observation.
2. Design Phase: Mapped AI-driven architecture for journal validation and report generation.
3. Prototype Development: Built an AI-based accounting prototype using Figma and simulated databases.
4. Evaluation: Conducted simulation-based performance testing and expert review.

Iterations persisted if evaluations indicated suboptimal performance, such as accuracy below predefined thresholds; refinements continued until metrics exceeded 95% accuracy in journal classification and processing efficiency. Quantitative evaluation compared manual and AI-based systems using 60 transaction samples, examining journal entry time, classification errors, and report compilation time. A paired t-test assessed significant performance differences. Qualitative analysis was based on user interviews and observational feedback.

Performance testing was conducted through controlled simulations using 60 recorded transactions representing typical SME operations. The objective was to compare system efficiency rather than population generalization.

System Architecture

The system comprised four layers: an input interface for data entry, an AI layer performing classification and validation, a storage layer ensuring consistency, and an output dashboard generating real-time reports.

RESULTS AND DISCUSSION

System Evaluation and Quantitative Finding

Following the development of the AI-based smart accounting prototype, performance evaluation was conducted through scenario simulations comparing the manual accounting process (Google Sheets-based) with the AI-assisted system at PT Diwangkara Wihaya Nusantara. The comparison focused on three main indicators: (1) journal entry processing time, (2) error rate in journal classification, and (3) financial report compilation time.

A sample of 60 transaction records was used for both methods. The results are summarized in Table 1.

Table 1. Comparison Between Manual and AI-Based Accounting Processes

Evaluation Metric	Manual System (Average)	AI-Based System (Average)	Improvement (%)
Journal Entry Processing Time (minutes)	4.5	1.3	71.1% faster
Journal Classification Error Rate (%)	8.2	1.4	82.9% reduction
Financial Report Compilation Time (minutes)	28.6	9.7	66.1% faster

The results indicate substantial performance improvement across all evaluated metrics. The AI-based prototype significantly reduced the average processing time per transaction and minimized journal misclassification errors. The improvement aligns with prior findings by Obaydin et al. (2023), who reported that firms integrating AI into accounting processes experienced notable increases in internal control reliability and reduced human-induced reporting errors.

In terms of internal control optimization, the system effectively demonstrated preventive and detective control functionalities as defined under the COSO framework (COSO, 2013). The preventive control mechanism operates through automated validation and account classification, which reduces the likelihood of misposting transactions at the input stage. Meanwhile, the detective control operates through anomaly detection algorithms that flag inconsistent or duplicate entries for review.

Qualitative Observations

From user interviews and participatory observations, several qualitative outcomes were noted:

- Enhanced user confidence in report accuracy, particularly among staff without formal accounting training.
- Improved transparency of transaction histories, as the system automatically created standardized journal entries with timestamped audit trails.
- Reduced communication friction between operational and financial departments, since real-time report generation allowed management to monitor expenditures and revenues simultaneously.

However, a recurring concern involved the need for training and change management. Users initially exhibited resistance to transition from spreadsheets to an AI interface, reflecting earlier studies emphasizing that digital adoption success depends not only on system capability but also on user readiness and digital literacy (Musyaffi et al., 2024).

Discussion

The results validate the central hypothesis that AI integration within accounting systems enhances both operational efficiency and internal control effectiveness. From a control theory perspective, embedding AI functionalities directly into accounting workflows creates a continuous monitoring environment — reducing the detection gap between error occurrence and correction (Bässler & Eulerich, 2024).

The system's performance improvements support the assertion that AI can serve as both a control enabler and process optimizer, consistent with prior research emphasizing the role of machine learning in enhancing control reliability and real-time assurance.

Furthermore, when viewed through the lens of the Design Science Research (DSR) methodology, the artifact demonstrates both practical relevance and theoretical contribution by offering a tangible solution to the persistent limitations of SME internal control environments (Moradi et al., 2024).

Nevertheless, limitations remain. The prototype relies on limited training data and does not yet incorporate deep-learning-based contextual reasoning, which may restrict its adaptability to complex transaction types. Additionally, the absence of integration with tax modules or external accounting systems limits the system's scalability for larger entities. These findings suggest that while AI can strengthen accounting controls, organizational governance and infrastructure readiness remain critical determinants of successful adoption (Nazari & Mukhtaruddin, 2025).

While the findings are based on simulated data within a controlled test environment, they reliably indicate relative performance trends and system feasibility, consistent with DSR validation procedures.

CONCLUSION

This research designed, developed, and evaluated an AI-based smart accounting system aimed at optimizing internal control processes in SMEs, using PT Diwangkara Wihaya Nusantara as a case study. Through a Design Science Research approach, the study demonstrated that the prototype effectively enhanced both preventive and detective control functions, aligning with the COSO internal control framework. Quantitative results revealed a significant improvement in efficiency, with processing time reduced by over 70%, classification errors lowered by approximately 83%, and report compilation accelerated by two-thirds. Qualitative observations further emphasized improvements in transparency, accuracy, and managerial decision support.

Theoretically, this study contributes to the growing literature on AI-driven internal control frameworks by offering empirical evidence of their feasibility in small-scale enterprises. Practically, it highlights the necessity of integrating automated validation mechanisms and real-time reporting into SME accounting workflows to mitigate fraud and reporting inaccuracies.

Future research should expand system testing using larger datasets and incorporate machine learning algorithms for adaptive classification and predictive control. Additionally, further investigation into the human–AI interaction dimension could provide insights into how user acceptance and training affect system sustainability and long-term control reliability.

REFERENCES

- Halim, H., Kesuma, T. M., & Siregar, M. R. (2023). *Digital transformation strategy to optimize company performance*. *Jurnal Manajemen Bisnis, Akuntansi dan Keuangan (JAMBAK)*, 2(11), 189–200. <https://doi.org/10.55927/jambak.v2i2.7022>
- Fadjri, M., & Hidayat, T. (2021). Analisis Faktor-Faktor yang Mempengaruhi Efektivitas Pengendalian Internal pada Usaha Mikro, Kecil, dan Menengah (UMKM). *Jurnal Riset Akuntansi dan Keuangan*, 9(2), 235-246.
- Manihuruk, L. C. G., & Dewayanto, T. (2025). *Peran dan tantangan artificial intelligence dalam kualitas pelaporan keuangan: A systematic literature review*. *Diponegoro Journal of Accounting*, 14(3), 1–11. <http://ejournal-s1.undip.ac.id/index.php/accounting>
- Meshki Miavaghi, M., & Houshmand Goorabi, M. (2025). *The Impact of Internal Control System and Artificial Intelligence on the Quality of Accounting Information System and the Accuracy of Financial Reporting*. *Management Strategies and Engineering Sciences*, 1–9. <https://msesj.com/index.php/mses/article/view/272>
- Moradi, A., Asnaashari, H., Rohban, M. H., Arabmazar Yazdi, M., & SafarZade, M. (2024). *Twenty-Five Years of Design Science Methodology in Accounting Research: A Bibliometric Analysis*. *Empirical Studies in Financial Accounting*, 21(81), 97–137. <https://doi.org/10.22054/qjma.2024.77182.2521>
- Musikavanhu, T. B., & Nqala, L. (2024). *Exploring challenges in designing and implementing internal control systems: A case study of small and medium enterprises in the Cape Metropole, South Africa*. *Business and Finance Journal*, 9(1), 75–84.
- Musyaffi, A. M., Johari, R. J., Hendrayati, H., Wolor, C. W., Armeliza, D., Mukhibad, H., & Izwandi, H. S. C. (2024). Exploring Technological Factors and Cloud Accounting Adoption in MSMEs: A Comprehensive TAM Framework. *International Review of Management and Marketing*, 15(1), 283–292. <https://doi.org/10.32479/irmm.17451>
- Nazari, E. C., & Mukhtaruddin, M. (2025). *Transformasi Artificial Intelligence dalam Akuntansi Keuangan: Inovasi dalam Pengambilan Keputusan atau Memunculkan Tantangan Baru?* *Jurnal Ekonomi, Bisnis dan Manajemen*, 4(1), 77–101. <https://doi.org/10.58192/ebismen.v4i1.3158>
- Obaydin, I., Richardson, V. J., Troshani, I., & Zurbruegg, R. (2023). AI-accounting capability and internal control effectiveness. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.4508268>
- Nqala, L., & Musikavanhu, T. B. (2023). *Using internal control systems for small and medium enterprise sustainability in a developing nation*. *Expert Journal of Business and Management*, 11(1), 60–65.
- Propheta, M. (2025). *Implementation of artificial intelligence (AI) in financial data processing and its impact on company operational efficiency*. *The 2nd International Students Conference on Economics and Business Excellence (ISCEBE)*, 2(1/AC-ISCEBE), 35.
- Syahlina, M. (2025). *The effect of using a manual accounting system on the accuracy of financial statements in small and medium enterprises (SMEs) Medan Marelan*. *International Journal for Advanced Research*, 1(6), 257–260. <https://journal.outlinepublisher.com/index.php/ijar>
- Committee of Sponsoring Organizations of the Treadway Commission (COSO). (2013). *Internal control—integrated framework: Executive summary*. <https://www.coso.org/guidance-on-ic>

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Bäßler, M., & Eulerich, M. (2024). Auditing with AI: A theoretical framework for applying machine learning across the internal audit lifecycle. *Internal Auditor*, 81(2), 24–31.
<https://doi.org/10.1080/07366981.2024.2312025>