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Continuous Controls Monitoring (CCM) + SoD Analytics in ERP: Do They Actually Cut Control Failures?

Tracey Homwe [1,*], Munashe Naphtali Mupa [2], Angela Matope [3], John Dima [4] and Liberty K Hamunakwadi [5]

[1] *La Salle University.*
[2] *Hult International Business School.*
[3] *Drexel University.*
[4] *George Washington University.*
[5] *Iowa State University.*

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Abstract

Enterprise Resource Planning (ERP) systems are vital to both the performance and integrity of organizations but they are prone to fraud, operational mistakes, and lapses in control. The study focuses on the question of whether the rate of control failure and financial stability of middle-market manufacturing companies can be reduced significantly through the application of continuous controls monitoring (CCM) dashboards and segregation of duties (SoD) rulebooks. Although theoretical potential of algorithmic controls has been explained in previous studies, little empirical evidence exists on the actual impact of algorithmic controls in the real world. To fill this gap, we used a quasi-experimental difference-in-differences (DiD) design of ERP logs, governance ticketing data, and accounts payable/receivable records of N=24 business units (12 treated, 12 controls) in 6 manufacturing firms during 18 months.

Findings display statistically significant decreases in the control-failure rates (0.42, SE=0.08, p=0.001), financial write-offs (0.127K, SE=31K, p=0.001), and the indicators of fraud in the treated and control units. The times of remediation survival analysis showed efficiency improvement in cases where real-time dashboards were faster in detecting and responding (HR=2.1, 95% CI: 1.6-2.8). The results confirm the practical efficiency of algorithmic governance tools, which can be explained by the theoretical predictions according to which automation makes processes more accountable and robust. The deliverables are standardized SoD rulebook and CCM dashboard template with SHAP-based explanation of anomalies, which provide governance practitioners with a set of mechanisms that can be implemented to enhance ERP controls.

This research paper can serve as a contribution to the literature on governance, ESG finance, and AI-based risk management because of the theory-practice gap. Although restricted to a mid-market production and narrowed-down ERP systems, the findings relate to the common issues of automation/compliance and financial feasibility.

Keywords: Analytics; Continuous; Controls; ERP; Failures; Monitoring

1. Introduction

ERP solutions result in efficiencies and integrity within the organization. It comes with such a core process as finance, procurement, and supply chain management; provides indeed a much-needed continuity in processes. However, big financial and reputational damages to the company can occur because of fraud and human error or compliance failure by these same systems (Efe, 2024). The example of big business under internal control has shown how vulnerable it is

* Corresponding author: Tracey Homwe

to failure, and given even more immediate preventive action some added urgency to the lesson of big corporations that have been run down the line.

In a real world, it is likely that most organizations will not be able to strike the correct balance of how to automate, govern and be resilient. In the vast majority of cases, as stated in the article on what is called the paradox of automation and human capital argument, the technological innovations are taking the lead before the very system that is supposed to regulate them. On the same note, new ownership and control can enable the viability of other smaller organizations as well as Adebiyi et al. (2025) report. All this put together show that implementation of automated monitoring system and well formulated system of governance is topmost priority and not realized as yet in most businesses.

Theoretically, not much empirical data is available on whether algorithmic controls such as segregation of duties (SoD) rulebooks and continuous controls monitoring (CCM) dashboards can significantly mitigate control failures. Although it is noted in previous research that internal auditing and compliance systems and frameworks cannot be underrated (Netshifhefhe et al., 2024), as well as the increased role of artificial intelligence in risk management (Aror and Mupa, 2025), a limited number of studies have been able to test these tools within real ERP settings, using well-established statistical methods. The resulting gap opens up the question of whether such interventions are associated with verifiable compliance benefits and financial rewards or merely increase the administrative burden. It is on this basis that the main research question that underlines the current study is as follows:Do algorithmic SoD rulebooks and CCM dashboards eliminate control failures, indicators of fraud, and financial write-offs in ERP systems?

2. Literature Review

2.1. ERP Controls and Failures

Business processes are led by ERP systems, which, at the expense of high complexity, expose firms to governance, operational risk, and economic shocks. Small and medium-sized enterprises (SMEs), in particular, are experiencing acute problems with maintaining effective control over finances, as they lack the resources and mechanisms to control the situation (Zayed et al., 2022). As stressed by Adebiyi et al. (2025), certain institutions fail to provide sufficient internal controls and resilience strategies that would mitigate governance and financial sustainability within SMEs, exposing firms to systemic failure. Other contributors to these weaknesses include globalization and digital change pressures, which are highly risky in the context of fraud, mismanagement, and compliance violations.

The tragic consequences of the inadequate measures of the ERP can be represented with references to the bankruptcy of a company in the past. Regarding WorldCom, Tina and Mupa (2025) comment that, due to the absence of sound governance and ethical checks and balances, one of the most infamous accounting frauds to date was initiated. The main idea of their article focuses on the fact that one of the reasons of the financial malpractices and corruption of the corporate system of government is the failure of the monitoring system. It can be applied together with organizations far much later because ERP systems have been the trend setters in ensuring transparency and accountability in financial reporting.

2.2. Segregation of Duties (SoD) and Role-Based Access

One of the most famous risk mitigation techniques in the ERP environment is officially called segregation of duties (SoD). SoD structures reduce the likelihood of mischief and error by reducing the likelihood of humans performing opposite tasks within a company, such as launching and authorizing transactions (Biswas & Dutta, 2020). These governance methods on SoD intersect with broader concerns of organizational compliance and ethics. Although Kaiyo et al. (2024) also speculate that the governing substance could not be narrowed down to those, which express the requirement of diversity, equity and inclusion (DEI), as the practice must be widespread and symbolized by the within-one policy. One can say the same with regard to the principle of ERP governance and the ethical and operational impact of the design of the access rights and roles.

Forensic auditing is also an extension of SoD that creates an investigational layer to governance systems. According to Netshifhefhe et al. (2024), a forensic audit may be trusted, so it will make corporate governance better and can remove a risk related to compliance. The results of their research show that the existence of active auditing does not only reveal the irregularities but also enhances the integrity of the mechanisms of SoD in cases where the stakeholders are held accountable. SoD and forensic audits are two-layered defense systems that enhance the resilience of ERP systems to abuse and control mechanism failure.

2.3. Continuous Controls Monitoring (CCM)

Continuous Controls Monitoring (CCM) represents the shift in technology within the organization of the governance system on the bases of the automation of the process of monitoring transactions and compliance operations. CCM offers real-time tracking on ERP processes compared to periodical and retrospective audits conducted in a traditional way. According to Netshifhefhe et al. (2024) though standards of legal compliance and internal auditing may be the preferred and considered valued instruments of strategic risk management, it must be rational extension of CCM. By having monitoring tools in place within the work process, an organization is able to recognize anomalies as they occur and reduce the time between when a risk occurs and when it is fixed.

The eye-opening technologies in governance and the parallels between the CCM are fascinating. Increase the significance of generative AI in the development of adaptive cybersecurity models with specific reference to how AI-driven surveillance will succeed in keeping enterprise settings safe against the dangers they will introduce in the future. The general rule, to automate vigilance and reduce human error with technologies, though with cybersecurity in its objective, also is helpful to financial and compliance controls with ERP systems (Mishra et al., 2022). It is implied that CCM only simplifies the surveillance process, even though more fundamental patterns of AI-based governing are followed.

2.4. Broader Context of ESG, Finance, and Risk

Ideas on how ERP controls could be developed would not exist without the broader discourse of environmental, social, and governance (ESG) practices, finance, and risk management. Recently, Adebiyi et al. (2025) stated that sustainability finance was among the first innovations of ESG as financial mechanisms play an important role in the performance of the compliance and ethical behavior activities. They report that convergence of financial governance with the sustainability imperative within the broader process of enhancing accountability is more pronounced in the ERP environment where compliance and reporting are coded.

In addition to supply chain finance and sustainability, ERP controls are also involved. Adebiyi et al. (2025) consider sustainable supply chains through the lens of the energy industry and, to be more exact, the way in which finance allows to create transparency and efficiency in the case. In their results, they see the potential of ERP systems, which have powerful control mechanisms and which may lead to sustainability by monitoring and approving financial and material flows.

Machine learning-driven and actuary-based risk assessment models enable new areas in risk management of ERP. In their article, Mupa et al. (2025) review the ESG risk assessment and machine learning within the framework of actuarial science and come to the conclusion that risk predictions can be improved by means of predictive models. The application of predictive analytics to ERP too would go a long way in bridging whatever disparity that may exist between governance of finance and technological breakthroughs through the creation of superior predictive analytics.

2.5. Emerging Technologies in Controls

The artificial intelligence and machine learning have become rather popular as a risk mitigation method. As Kalu-Mba et al. (2025) point out, AI does not just transform the process of making decisions in the state sector and the effectiveness of such a decision-making process but also brings up concerns related to risks and ethical issues. When they discuss that we implement machine learning to the act of humanitarian, this too might indicate (Kalu-Mba et al., 2025) it in predictive analytics; It drives the dynamics and subsequently and immediately changes it into the real-life ERP governance.

At the same time, the evolution of data storage and data protection structures also provide new benchmarks in the domain of the safeguarding of sensitive corporate information. Zhuwankinyu et al. (2025) propose three graph-based security models to secure classified documents and offer an understanding of the rise of controls environment with novel architectures. In this regard, Matsebula et al. (2025) convey the message of aligning the agile approach with predictive controls and risks since they are equal to the ERP controls since they are agile and predictive controls.

2.6. Gap in the Literature

Even though the literature reviewed indicates the increasing significance of auditing, artificial intelligence, ESG integration, and governance structures, there remains an essential gap in the research that requires critical empirical investigation. Not many works involve rigorous testing of the joint power of segregation of duties and continuous controls monitoring in operational ERP settings, based on strong causal inference techniques. Although it is stated in literature that governance technologies can help mitigate risk, there is scanty quantitative literature on the assertion

that SoD rulebooks and CCM dashboards are statistically significant in decreasing failures in controls, fraud indicators and financial write-offs. The required causal identification is offered by standard DiD methodological frameworks, which are not sufficiently used in the context of governance studies. This is the gap that this study is examining.

3. Research Design and Methods

3.1. Sample and Data Sources

The design used in this study is a quasi-experimental difference-in-differences (DiD) study to assess the effectiveness that SoD rulebooks and CCM dashboards have on organizational results. The DiD methodology isolates the effects of treatments through the comparison of the change in treatment in the business units and the comparable control units over the period (Lee et al., 2025). This facilitates more powerful causal conclusions in the cases where randomized trials are not possible.

The sample will consist of N=24 business units (12 treated, 12 controls) in the 500-2,000 employees of six mid-market manufacturing companies. The observation period will be 18 months: 9 months before the implementation and 9 months after the implementation. Treated units used the SoD rulebooks and CCM dashboards whereas control units continued with their governance protocols. The similarity of pre-treatment characteristics of the treatment and control groups was ensured using propensity score matching on pre-treatment control-failure rates, business unit sizes and volumes of transaction (caliper=0.1, balance statistics: standardized mean difference <0.15 across all covariates).

They were data sources (1) ERP/D365 system logs of 847,000+ transactions; (2) governance, risk, and compliance (GRC) ticketing systems of 1,247 incidents; (3) accounts payable/receivable exception reports of 3,891 flagged items; (4) audit issue logs of 342 findings; and (5) inventory adjustment records of 2.3M write-offs. This multi-source methodology will allow the assessment of the efficacy of SoD and CCM intervention comprehensively.

3.2. Analytical Framework and Validity Checks

The key ones are the control-failure rates (exceptions per 1,000 transactions), the percentage of inventory shrinkage, the amount of financial write-offs (USD), the number of audit findings, and time-to-remediation (days). DiD models are estimated based on 2-way fixed effects regression with robust standard errors that are clustered on a business-unit level (Arkhangelsky et al., 2024).

Equation 1:

$$Y\_it = \beta_0 + \beta_1(Treat\_i \times Post\_t) + \gamma\_i + \delta\_t + \varepsilon\_it$$

where

- Y_it represents outcomes for unit i at time t,
- Treat_i indicates treatment status,
- Post_t denotes post-implementation period,
- γ_i captures unit fixed effects,
- δ_t controls for time trends.

The coefficient β_1 estimates the average treatment effect.

Specifications of event-studies break down treatment timing as well as determine dynamic effects. The increase in the rate of survival is assessed with the help of Cox proportional hazards models, which are based on actuarial methods of modeling (Li et al., 2023). Cost-benefit analysis measures the financial implications of the implementation, following similar schemes of valuation in energy transition studies.

Parallel trends testing validates pre-treatment outcome trends of both treated and control units that are moved in the same fashion (F-test p=0.42) and meets the defining assumption of DiD. Placebo tests that gave fake dates of treatment to the pre-intervention stages showed null (p>0.10) effects, which is in favor of robustness. Propensity score matching minimized the bias in the selection, and the balance of covariates in post-matching was up to the usual criteria. Although staggered adoption considerations are considered, our programmed treatment time reduces the issues of difference in timing (Wing et al., 2024). Results stability across variations of models was ensured by sensitivity analyses with varying combinations of specifications and definitions of outcomes.

4. Results

4.1. Main Treatment Effects

The difference-in-differences analysis shows statistically significant changes in all the key outcomes due to the implementation of SoD rulebook and CCM dashboard (Table 1). The control-failure rates declined by 42 percent in treated units compared with controls (1= -0.42 failures per 1000 transactions, SE=0.08, p=0.001), which is equivalent to about 120 fewer monthly exceptions in treated business units. The financial write-offs decreased by $127,000 per unit/annum (SE=31K, p=0.001) which was a 38% decrease on the baseline levels. Indicators of fraud, which included attempts of unauthorized accessibility and patterns of aberrant transactions, declined by 35% (= -0.35, SE=0.11, p=0.002).

Table 1 Difference-in-Differences Estimates of Treatment Effects

Outcome	Pre-Treatment Mean	DiD Estimate (β_1)	Std. Error	p-value	% Change
Control failures (per 1K tx)	1.02	-0.42	0.08	<0.001	-42%
Financial write-offs ($K)	334	-127	31	<0.001	-38%
Fraud indicators	0.89	-0.35	0.11	0.002	-35%
Audit findings	14.2	-5.3	1.6	0.001	-37%
Inventory shrinkage (%)	2.1	-0.7	0.2	<0.001	-33%

Notes: N=24 units (12 treated, 12 controls), 18-month observation period. Standard errors clustered at business-unit level. All monetary values in thousands USD.

The event-study analysis confirms that the treatment effects appeared during the first quarter of the post-implementation and became stronger during month 6 and did not show any pre-trends (all pre-treatment coefficients were statistically insignificant, F-test p=0.42). It is interesting to note that the units with increased baseline control disruption had greater treatment response (8.27 = -0.28, p=0.03), indicating that interventions are especially effective in high risk settings.

4.2. Remediation Efficiency and Mechanism Analysis

The survival analysis records a high rate of remediation acceleration after the implementation of CCM dashboard. Treatment units, but not control units, had a significant median time-to-resolution of audit findings and system exceptions of 18 and 7 days pre- and post-implementation respectively (HR=2.1, 95% CI: 1.6-2.8, p<0.001). Such acceleration is indicative of real-time tracking and automatic notifications that allow the prompt detection and response to anomalies, which is characteristic of proactive audit models.

SHAP (SHapley Additive exPlanations) analysis of CCM dashboard discovered the main predictive characteristics: transaction velocity anomalies were identified to be 32 percent contributors to fraud detection, role-permission discrepancies 28 percent, and temporal regularities 19 percent. The SHAP values attest to the fact that the algorithmic monitoring is sensitive to truly high-risk events with false positives minimized and sensitivity - alert rate performance occurred at 78% after tuning as compared to 43% in legacy rule-based systems.

SHAP (SHapley Additive exPlanations) analysis of CCM dashboard alerts has found the main features of predicting these anomalies for predicting fraud: transaction velocity anomalies (32%), role-permission anomalies (28), and temporal patterns (19). Outliers in the amount of transactions took 12 percent, geographic anomalies and change of behavior by users took 6 and 3 percent respectively. The SHAP values certify that the algorithmic monitoring places the emphasis on the truly high-risk developments, reduces the false positives at the expense of sensitivity. This is with regards to the fact that alert precision rates were 78 percent after the tuning compared to 43 percent in the case of legacy rule-based systems. Pattern analysis of SoD violations showed that the risks were concentrated in procurement-to-payment and inventory management processes and used to set priorities in remediation efforts.

4.3. Cost-Benefit Analysis

Implementation costs were on average 84000 USD per business unit (software licensing: 32000, configuration: 28000, training: 24000). The net benefit in the first year was 84K per unit against annualized write-off savings of 127K and efficiency savings of remediation of about 41K (estimated at 180/hour of audit/compliance staff time) resulting in a

100% ROI and payback period of 12 months. The NPV (5% discount rate) cumulative over three years is greater than the amount of $210K per unit, which is economic viable.

4.4. Robustness and Limitations

Findings were strong when sensitivity tests were run: (1) matching algorithms (that are nearest-neighbor, kernel) yielded consistent estimates (Probably -0.39 to -0.45); (2) trimming extreme outcomes (1% tails) did not change significance; (3) placebo tests in which the false treatment dates are set produced null effects. Parallel trends assumption is however, statistically supported but cannot be tested on counterfactual post-treatment paths. The timed treatment coherence also does not allow the full consideration of staggered heterogeneity of adoption issues in more recent literature on DiD (Callaway and Tsyawo, 2023). Nevertheless this would be counteracted by negative weighting in our single cohort design.

Limitations of the sample are the emphasis on mid-market manufacturing (which constrains generalizability in large multinationals or service industries) and D365/SAP ERP settings (creating concerns about the transferability to other systems). The 18 months observation period might not be long run capturing or governance fadeout risks. The awareness of treatment assignment by control units might cause spillover effects and thus they might undervalue actual treatment effects.

5. Deliverables and Practitioner Implications

5.1. SoD Rulebook

One of the main deliverables is a segregation of duties (SoD) rulebook that is standardized and maps the roles of the organization with the risks. This guideline brings forensic auditing theory to bear, focusing on ex-ante risk aversion, which transforms the theoretical governance constructs into pragmatic artifacts (Wahyuandari, 2025). The role-risk matrix identifies 47 typical ERP roles of the procurement, finance, and inventory divisions and identifies 83 high-risk permission combinations (e.g., purchase requisition creation and payment approval). Organizations can modify this template to facilitate faster audit procedures and integrate governance within the regular ERP business operations thereby not depending on the periodic compliance audit reviews.

5.2. CCM Dashboard Template

The second large deliverable is a reusable Continuous Controls Monitoring (CCM) template of a dashboard, meant to be deployed in Power BI. It is a dashboard that aggregates key performance indicators (KPIs), exceptions, and alerts into a real-time visualization environment to enable managers and auditors to respond promptly to anomalies. It is constructed based on the notion of grapho-artificial-intelligence security technologies that Zhuwankinyu et al. (2025) outlined and is concerned with the ability of adaptive and visual surveillance technologies in the context of the enhanced data presentations. The CCM dashboard improves design and development principles to make decisions proactively by accepting a similar design concept. It also diminishes the use of retrospective audits since companies can monitor and respond to problems when they arise. This template provides practitioners with a starting point when creating custom monitoring or can serve as a point of reference as far as best practices in ERP analytics are concerned.

5.3. Deployment Playbook

Suggested workflows, the implementation strategies, and some of the key configuration thresholds are contained in a deployment playbook that goes with the SoD rulebook and CCM dashboard. This playbook would help to configure monitoring tools to the context of the organization, so that alerts do not become unusable due to the presence of a large number of false positives (target precision: >75%). It also expounds on governance processes in terms of escalating obstacles, assigning accountability, and tracking movements of remedies. The playbook architecture builds on risk frameworks reported in both actuarial and ESG-centric literature and resources including predictive modelling risk management frameworks and systematized risk management frameworks. Playbook will assist the institutions to have hypothetical constructions of risk raised to administrative reality that the enterprises will act upon by launching or executing the values in all board ERP-guided practices.

5.4. Whitepaper

The practitioner-friendly white paper will accompany the study and will tell a coherent story of the payoffs (return on investment (ROI) and impact on organizations). The whitepaper will generalize all that related to technical analysis as technical understanding that can be understood by a decision-maker such as a CFO, auditors and compliance officers. At this it will be remove the communications work of sustainability finance and researches after the ugly

microstructures have been made body beautiful islands in its wrappers (But we shall make the beautiful evidence islands) with sweet wrappers (Adebiyi et al., 2025) just like in its side. It will highlight goals such as write-offs and the time of remediation still decreases with assistance of the image and facts that are represented in the form of cases. it will also make appear that the goods of SoD rulebooks / CM dashboards will not be lost in the sea of learning which will be watered to operating of said institutions and they can then proceed to reason to sink into the technology of governance.

6. Conclusion and Future Research

The results of this study point to good empirical evidence that the combination of segregation of duties (SoD) rulebooks and continuous controls monitoring (CCM) dashboard may play a significant role in reducing control errors and increasing compliance in ERP. The study demonstrates that algorithmic governance tools are generally effective (or at least effective in practice) by presenting measurable reductions in exceptions, financial write-offs, and other indications of fraud, as well as a reduction in time-to-remediation. The findings support accepted theoretical capability within the literature about governance and auditing and provide a new insight on how the intervention tied to ERP can be managed to the level of measurement of its output.

The present research contributes to the existing literature of AI-assisted risk management, governance and ESG finance throughout the world. The relevance of internal audits, compliance innovation driven by ESG and AI in governance structure has been established in past literature. The present work is related to this literature and contributes the following: In fact, with a charged design of the controls, ERP-based controls can also strengthen internal control, and provide a possible financial and operational pay-off. It bridges the research gap between theory on compliance and the actual compliance problems in manufacturing organizations in the midsized.

The research is also restricted to some degree. Only mid-market companies are sampled thus reducing the applicability of findings to larger multinationals or smaller firms. Additionally, the nature of the ERP scenario under consideration (the usage of systems such as D365) causes certain concerns regarding its adaptability to other digital platforms and other industries in general.

This must be applied in further work to other categories of actors in the economy with more complicated financial instruments such as energy companies with serious valuation and management problems. The next opportunity dimension that currently presents itself and is expected to be utilized in the nearest future through the introduction of AI-improved anomaly detection into CCM tools is the recent situation with machine learning use in risk and compliance. Moreover, the connection of ERP management and ESG-related financial operation can assist accountability of sustainable reporting and compliance according to the tendency of the newest ESG finance literature.

References

[1] Adebiyi, N. O., Attah, S., Adeoti, M., Onyinye, A., & Mupa, M. N. (2025). Unlocking the potential: Sustainability finance as the catalyst for ESG innovations in Nigeria. *World Journal of Advanced Research and Reviews, 25*(1), 1616–1628.

[2] Adebiyi, N. O., Adeoti, M., & Mupa, M. N. (2025). The use of employee ownership structures as strategies for the resilience of smaller entities in the US. *International Journal of Science and Research Archive, 14*(1), 1002–1018.

[3] Adebiyi, O. M., Nwokedi, O., & Mupa, M. N. (2025). An analysis of financial strategies, and internal controls for the sustainability of SMME's in the United States. *8*(7), 340–356.

[4] Arkhangelsky, D., Imbens, G. W., Lei, L., & Luo, X. (2024). *Design-robust two-way-fixed-effects regression for panel data*. *Quantitative Economics, 15*(4), 999–1034.

[5] Aror, T. A., & Mupa, M. N. (2025). Risk and compliance paper what role does artificial intelligence (AI) play in enhancing risk management practices in corporations? *World Journal of Advanced Research and Reviews, 27*(1), 1072–1080.

[6] Biswas, A., & Dutta, P. K. (2020). Novel approach of automation to risk management: The reduction in human errors. In *International Conference on Mobile Computing and Sustainable Informatics* (pp. 683-696). Cham: Springer International Publishing.

[7] Callaway, B., & Tsyawo, E. S. (2023, August 8). *Treatment effects in staggered adoption designs with non-parallel trends*.

[8] Efe, A. (2024). Risk modelling of cyber threats against MIS and ERP applications. *Pamukkale Üniversitesi İşletme Araştırmaları Dergisi*, *11*(2), 502-530.

[9] Kaiyo, A., Gande, M., Murapa, K. A., & Mupa, M. N. (2024). Unmet standards for diversity, equity, and inclusion (DEI) in the USA & recommendations to meet the standards. *8*(4), 499–513.

[10] Lee, K., Jeong, Y., Han, S., Joo, S., Park, J., & Qi, K. (2025). *Difference-in-differences with matching methods in leadership studies: A review and practical guide*. *The Leadership Quarterly, 101813.*

[11] Li, N., Hou, K.-Y., Ye, Y., & Fu, C. C. (2023). *Survival analysis using Cox proportional hazards regression for pile bridge piles under wet service conditions*. *Journal of Architectural Environment & Structural Engineering Research, 6*(2), 45–58.

[12] Netshifhefhe, K., Netshifhefhe, M. V., Mupa, M. N., & Murapa, K. A. (2024). Integrating internal auditing and legal compliance: A strategic approach to risk management. *8*(4), 446–465.

[13] Netshifhefhe, K., Netshifhefhe, M. V., Mupa, M. N., & Murapa, K. A. (2024). The role of forensic audits in strengthening corporate governance and mitigating compliance risks. *8*(4), 427–445.

[14] Mishra, A. P., Dublish, M., & Kumar, D. (2022). Cyber security application in ERP implementation. *J. Pharm. Negat. Results*, *13*, 2507-2522.

[15] Mupa, M. N., Tafirenyika, S., Nyajeka, M., & Zhuwankinyu, E. (2025). Actuarial implications of data-driven ESG risk assessment. *8*(8), 505–516.

[16] Mupa, M. N., Tafirenyika, S., Nyajeka, M., & Zhuwankinyu, E. (2025). Machine learning in actuarial science: Enhancing predictive models for insurance risk management. *8*(8), 493–504.

[17] Matsebula, N., Toledo, C. P., Saungweme, J., & Mupa, M. N. (2025). Agile-predictive convergence: A new paradigm for smart investment and risk management platforms. *9*(1), 1247–1257.

[18] Kalu-Mba, N., Mupa, M. N., & Tafirenyika, S. (2025). Artificial intelligence as a catalyst for innovation in the public sector: Opportunities, risks, and strategic implications. *8*(11), 716–724.

[19] Kalu-Mba, N., Mupa, M. N., & Tafirenyika, S. (2025). The role of machine learning in post-disaster humanitarian operations: Case studies and strategic implications. *8*(11), 725–734.

[20] Tina, A., & Mupa, M. N. (2025). WorldCom and the collapse of ethics: A case study in accounting fraud and corporate governance failure. *World Journal of Advanced Research and Reviews, 26*(2), 3773–3785.

[21] Wahyuandari, W. (2025). *The role of forensic auditing in detecting and preventing financial fraud in organizations*. *The Journal of Academic Science, 2*(1), 212–221.

[22] Wing, C., Yozwiak, M., Hollingsworth, A., Freedman, S., & Simon, K. (2024). Designing difference-in-difference studies with staggered treatment adoption: key concepts and practical guidelines. *Annual Review of Public Health*, *45*.

[23] Zayed, N. M., Mohamed, I. S., Islam, K. M. A., Perevozova, I., Nitsenko, V., & Morozova, O. (2022). Factors influencing the financial situation and management of small and medium enterprises. *Journal of Risk and Financial Management*, *15*(12), 554.