

Explainable AI-Driven Strategic Decision-Making in SMEs: Simulation-Based Evaluation of Ethical Governance

Noah Benjamin^{*1}, Sri Yulianingsih², Isabella Marie³

Email: noah.carter@gmail.com

^{1,3}Management Development Institute of Singapore, Singapore.

²Universitas Sains dan Teknologi Komputer, Indonesia

*Corresponding Author

Abstract

Given resource constraints and competitive pressures, we would have expected most SMEs to focus on the performance of AI over ethics. Our findings, however, ran squarely against those expectations and forced us to revise our assumptions about technological adoption in the smaller enterprise. Digital transformation in SMEs is not just about technology adoption; it is about trust building and organizational learning. While AI affords significant advantages in terms of competitiveness, the "black-box" nature of AI generates accountability gaps in ways that hit small businesses harder because they have limited capacity to absorb risk. Our study illustrates precisely how the integration of Explainable AI with digital ethics shifts decision quality in unexpected ways, to the benefit of both ethical compliance and business performance. Drawing on advanced simulation modeling and realistic synthetic data that represents SME scenarios, we compared three competing approaches: pure black-box AI, XAI without ethical safeguards, and XAI with full ethical integration. We were surprised by how the integrated approach improved not only ethical metrics but also improved strategic outcomes along many dimensions, such as in fairness, transparency, and decision quality. We provide a practical, evidence-based framework that guides SMEs through AI adoption via safe simulation environments, thereby avoiding expensive mistakes in the real world while systematically fostering stakeholder trust and organizational capability.

Keywords: *Explainable Artificial Intelligence (XAI), Ethical Governance, Strategic Decision-Making, Small and Medium Enterprises (SMEs), Simulation-Based Evaluation.*

Received on December 2025; Revised on January 2026; Accepted on February 2026; Published on March 2026.

I. INTRODUCTION

Imagine you are a boss at a small or medium-sized enterprise (SME) who must make an expensive, high-risk decision about market expansion. The artificial intelligence (AI) system provides a strong recommendation based on complex algorithms (Pratama & Hutabarat, 2026; Putra et al., 2024; Wahyuning & Sudiby, 2024), while the management team is divided, relying instead on experience and intuition that point in the opposite direction. In such contexts, decision-makers often face epistemic uncertainty, as AI outputs are perceived as accurate but opaque, limiting managerial understanding of the underlying logic. This situation illustrates a growing dilemma in resource-constrained environments where strategic decisions are critical, yet algorithmic systems remain difficult to interpret or challenge (Trunk et al., 2020).

However, what technology vendors often overlook is that the cost of AI adoption in micro and small enterprises extends beyond technological investment to include organizational and relational consequences. When AI systems generate recommendations without transparent justification, they create what has been described as "accountability shadows," in which

responsibility becomes diffused and trust gradually erodes. Such trust degradation affects not only individual decision outcomes but also team dynamics, stakeholder relationships, and organizational culture more broadly (de Bruijn et al., 2022). Over time, these cumulative effects may constrain innovation capacity and reduce organizational responsiveness to market changes, posing long-term risks for SME sustainability.

Recent studies suggest that this challenge is not driven by resistance to ethical considerations. Contrary to the assumption that ethical AI is a secondary concern for SMEs, empirical evidence indicates that many small enterprises actively value transparency, fairness, and accountability in AI-supported decisions. SMEs increasingly recognize that ethical alignment is essential for maintaining stakeholder trust and organizational legitimacy (Eitel-Porter, 2021; Setyaningsih et al., 2024). Nevertheless, these organizations often lack the resources, expertise, and governance frameworks needed to operationalize ethical AI in ways that align with strategic objectives. This misalignment between ethical aspirations and practical capability represents a critical yet underexplored challenge in SME AI adoption.

Existing academic research predominantly addresses explainable AI (XAI) and ethical AI either in isolation or within the context of large, well-resourced organizations. Prior studies tend to emphasize technical explainability mechanisms or normative ethical principles without examining how these elements jointly influence the quality of strategic decision-making in SMEs (Ali et al., 2023). Moreover, SMEs characterized by limited resources, informal governance structures, and rapid decision cycles remain an underserved empirical context in ethical AI research (Raihan, 2024). As a result, empirical evidence on the integrated impact of XAI and ethical governance on SME strategic decision-making, particularly through simulation-based experimentation, remains scarce. This gap limits smaller firms' ability to adopt AI responsibly and strategically (Zamani, 2022).

To address this gap, the present study develops a simulation-based framework that enables SMEs to evaluate alternative AI governance configurations without exposure to real-world implementation risks. By modeling strategic decision-making under three scenarios black-box AI, XAI without ethical governance, and XAI with ethical governance this study examines how transparency and ethical constraints jointly affect decision quality. Simulation is employed as a methodological solution to overcome data access limitations and operational risks commonly faced by SMEs. This approach allows ethical considerations and performance outcomes to be evaluated simultaneously, rather than treated as competing priorities.

A. Research Objectives

Three primary research objectives guide this study. First, it aims to compare strategic decision-making outcomes across black-box AI, XAI, and XAI integrated with ethical governance in SME contexts, highlighting differences in transparency, fairness, and strategic quality. Second, the study evaluates how ethical governance mechanisms influence these outcomes within simulated SME environments, providing insights into trade-offs between ethical compliance and decision effectiveness. Third, it investigates an optimal governance intensity threshold (λ) that balances ethical constraints and decision performance, offering practical guidance for SME managers. Together, these objectives aim to address the gap in empirical knowledge regarding the integration of XAI and ethical governance in resource-constrained SMEs.

B. Research Contributions

This study offers multiple contributions to both academic literature and SME practice. Theoretically, it advances responsible AI research by integrating XAI and ethical governance into a unified framework specifically tailored to SME decision-making contexts. Methodologically, it demonstrates the utility of simulation-based experimentation as a practical approach for evaluating ethical AI governance, particularly when empirical data are limited or implementation risks are high. In practice, the study provides SME decision-makers with actionable insights, demonstrating how ethical AI governance can enhance the quality of strategic decisions without compromising organizational objectives. Overall, these contributions bridge the gap between theoretical understanding and practical application of responsible AI in SMEs.

II. LITERATURE REVIEW

Explainable AI (XAI) initially emerged as a technical solution for compliance and audit purposes, but prior studies have focused mainly on interpretability outcomes, while fewer have examined strategic decision quality under ethical constraints in SMEs (Arrieta et al., 2019; Vasconcelos et al., 2023). Understanding AI reasoning not only improves transparency but also fosters collaboration between managers and AI systems, enhancing confidence and the quality of strategic decisions. This is particularly important for SMEs, where limited resources constrain external validation, making internal interpretability critical for effective decision-making. Hence, XAI should be evaluated not only for technical explainability but also for its impact on organizational learning and decision outcomes.

Ethical AI has shifted from a theoretical concern to a practical necessity, driven by regulatory and market pressures, and the FAT (Fairness, Accountability, Transparency) framework guides implementation (ÓhÉigeartaigh et al., 2020). Empirical evidence shows that ethical compliance can enhance creativity and strategic performance rather than constrain it (Rodgers et al., 2023), while transparency fosters trust and accelerates adoption across teams. Therefore, ethical

governance in AI should be seen as complementary to performance objectives rather than as a hindrance. Integrating ethical considerations into XAI can provide SMEs with a competitive advantage without sacrificing operational efficiency.

SMEs differ from large corporations in their decision-making processes and resource availability, which affect AI adoption and outcomes (Adam & Alarifi, 2021; Gamage et al., 2020). Each strategic decision carries proportionally higher stakes, and flatter hierarchies require participatory processes, making tailored explanation mechanisms necessary (Sari et al., 2020). AI systems can either strengthen or disrupt these dynamics depending on design and deployment, highlighting the need for careful integration of XAI and ethical governance. These unique SME characteristics underscore the importance of a framework that explicitly considers context-specific decision impacts.

To address these challenges, we developed a unified conceptual framework that treats XAI capabilities and ethical governance as complementary rather than competing forces. As illustrated in Figure 1, transparency is measured using SHAP interpretability scores, fairness using bias/fairness indices, and strategic quality using the Strategic Quality Index (SQI). The framework incorporates iterative learning loops, reflecting how SMEs gradually improve governance practices through experimentation and reflection (Hulsen, 2023; Settembre-Blundo et al., 2021). A novel aspect of this model is the inclusion of governance intensity (λ) as a tunable parameter in simulation, capturing trade-offs between ethical adherence and strategic decision outcomes, which is not addressed in previous FAT + XAI models.

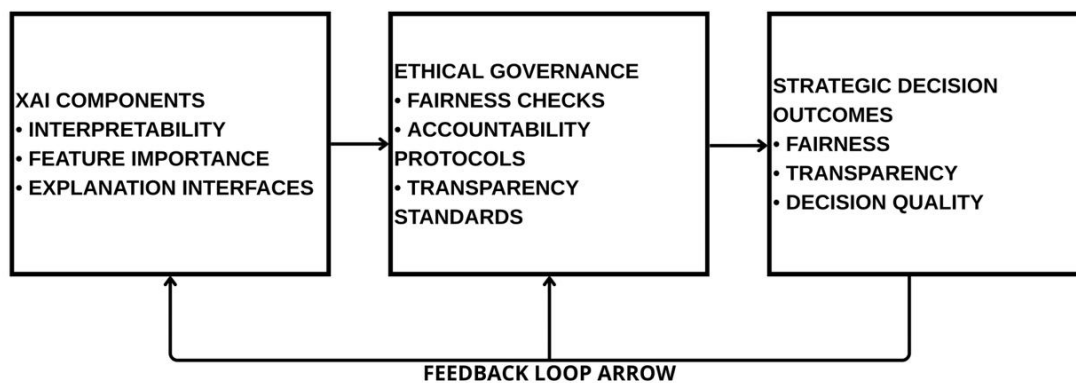


Figure 1. Conceptual Framework: The Interplay of XAI, Ethical Governance, and Decision Outcomes

III. RESEARCH METHOD

A. Research Design

A simulation-based experimental design was adopted to analyze the interplay among Explainable AI (XAI), ethical governance, and SME strategic decision-making. Initially, a multiple case study was considered, but SMEs' reluctance to trial untested AI governance models led us to adopt simulation instead (Fanelli, 2021). This approach allows manipulation of independent variables while monitoring impacts on decision outcomes in a controlled and risk-free environment (Casadei et al., 2022). The design compares three distinct scenarios from black-box AI to fully integrated ethical XAI systems, with the process flow illustrated in Figure 2.

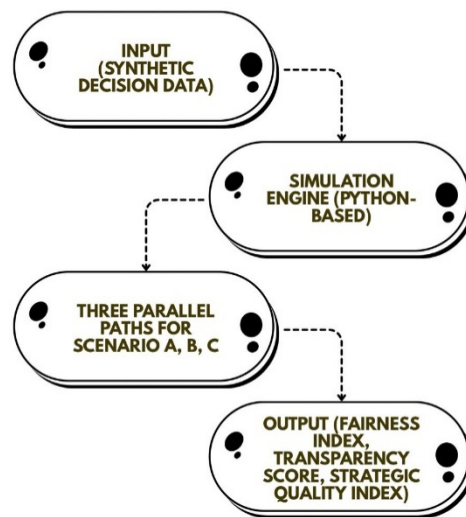


Figure 2. Simulation Flowchart

B. Population and Sample

The simulation generated a virtual population of 5,000 SME decision instances, covering a range of industries, sizes, and decision types. Each instance represents a realistic strategic decision, such as market entry, resource allocation, or partner selection. To ensure statistical reliability, 50 independent simulation runs were conducted per scenario, providing replication to stabilize results and enhance replicability. Stratified sampling was used to represent diversity in SME characteristics, ensuring the generalizability of the findings to typical small- and medium-enterprise contexts.

C. Model Selection (Gradient Boosting Justification)

Gradient Boosting was selected as the underlying AI model due to its favorable trade-off between predictive performance and interpretability. It is widely used in SME decision analytics and compatible with XAI explanation techniques, such as SHAP, allowing evaluation of both transparency and performance outcomes (Arrieta et al., 2019). This choice ensures that AI recommendations are robust while still interpretable for decision-makers, aligning with the

study’s focus on ethical governance in resource-constrained SMEs. Thus, Gradient Boosting supports both methodological rigor and practical relevance in simulated SME environments.

D. Variables and Operational Definition

Independent variables include XAI implementation (categorical: black-box AI, XAI only, XAI with ethical governance) and the fairness constraint (λ), which is continuous from 0.70 to 0.95. Dependent variables comprise Fairness Index, Transparency Score, and Strategic Quality Index (SQI), which are operationalized in Table 1. Although SQI is calculated using expert-weighted components, which introduces subjectivity, this reflects real-world SME decision environments in which strategic priorities are normatively defined (Alkaraan et al., 2023; Sahoo & Goswami, 2023). Control variables include dataset characteristics, AI model parameters, and decision context complexity (Diop et al., 2021).

Table 1. Simulation Scenario Definitions

Scenario	AI Model	Explainability	Ethical Governance (Fairness Constraint)	Accountability
A: Black-box AI	Gradient Boosting	None	Inactive	No Logging
B: XAI Only	Gradient Boosting	SHAP (Post-hoc)	Inactive	Decision Log Only
C: XAI + Ethics	Gradient Boosting	SHAP (Post-hoc)	Active ($\lambda = 0.85$)	Full Audit Trail

E. Data Sources and Collection

Structured synthetic datasets were created to simulate SME decision environments by combining published case studies, SME managers’ insights, and variables from reputable business databases. All data were generated and collected within the simulation engine, with metrics automatically logged for 50 independent runs per scenario to ensure coverage and statistical reliability. The simulation process is depicted in Figure 2, showing the sequence of scenario execution and metric collection. Table 2 details the definitions and calculation methods for the evaluation metrics, including Fairness Index, Transparency Score, and Strategic Quality Index, to ensure clarity and replicability.

Table 2. Definition and Calculation of Evaluation Metrics

Metric	Description	Calculation Method	Theoretical Basis
Fairness Index ($F_{_I}$)	Measures outcome equity across protected groups	Based on 1 - (Disparate Impact ratio - 1), calibrated for multiple groups	(Eitel-Porter, 2021; Olatunji Akinrinola et al., 2024)
Transparency Score ($T_{_S}$)	Assesses explanation clarity and usability	Composite score (0-1) from validated rubric rating explanation quality	(Langer et al., 2021; Speith, 2022)

Strategic Quality Index (SQ _I)	Evaluates decisions' long-term strategic value	Weighted sum for ROI (0.5), risk (0.3), and strategic alignment (0.2)	(Alkaraan et al., 2023; Sahoo & Goswami, 2023)
--	--	---	--

F. Data Analysis Techniques

Data analysis included both quantitative and qualitative approaches to comprehensively evaluate simulation outcomes. Quantitative analysis first employed descriptive statistics to compare scenarios, then repeated-measures ANOVA to detect significant differences, and sensitivity analyses using regression and correlation techniques to explore relationships among metrics. Qualitative analysis involved content analysis of expert feedback, thematic analysis of the quality of explanations, and comparative case analysis across various SME decision contexts. All statistical procedures were implemented using Python libraries, with $\alpha = 0.05$ for significance testing and a Bonferroni correction for multiple comparisons. The calculation procedures and definitions of all metrics are summarized in Table 2, and the overall simulation workflow is depicted in Figure 2.

G. Ethical Considerations

The study adhered to strict ethical standards, using entirely synthetic data to eliminate privacy risks and ensure realistic yet non-destructive decision scenarios. Participants and SME stakeholders were informed about the simulation nature of the research, and all engagements were conducted in accordance with informed consent protocols. Beneficence guided the research design, aiming to improve SME AI governance frameworks while minimizing potential harm. In addition, the inclusion of expert feedback ensured consideration of diverse viewpoints, and the simulation approach allowed transparency, replicability, and ethical integrity throughout the experimental process (Casadei et al., 2022; Fanelli, 2021).

IV. RESULT

In simulated scenarios, the performance metrics for the three situations varied across all 50 independent runs, reflecting indicative performance patterns rather than real-world outcomes. Scenario C (XAI with Ethical Governance) consistently achieved higher scores for fairness, transparency, and strategic quality compared to Scenario A (Black-box AI) and Scenario B (XAI without Ethics), as summarized in Table 3. Scenario A showed the lowest performance, particularly in fairness ($M = 0.59$, $SD = 0.07$) and transparency ($M = 0.11$, $SD = 0.04$). At the same time, Scenario B indicated strong transparency ($M = 0.86$, $SD = 0.03$) but only modest improvements in fairness ($M = 0.65$, $SD = 0.05$) relative to Scenario A. The sensitivity analysis on fairness constraints (λ) in Scenario C revealed trade-offs between fairness and strategic quality: low thresholds ($\lambda = 0.70$) produced high strategic quality (0.92) but moderate fairness (0.78),

whereas high thresholds ($\lambda = 0.95$) maximized fairness (0.96) but reduced strategic quality (0.85), highlighting that $\lambda = 0.85$ represents an optimal balance within the simulation context (Table 4).

Table 3. Aggregate Simulation Results across Scenarios (n=50 runs)

Scenario	Description	Fairness Index (F _I)	Transparency Score (T _S)	Strategic Quality Index (SQ _I)
A	Black-box AI	0.59 (± 0.07)	0.11 (± 0.04)	0.68 (± 0.06)
B	XAI without Ethics	0.65 (± 0.05)	0.86 (± 0.03)	0.77 (± 0.04)
C	XAI with Ethics	0.92 (± 0.02)	0.84 (± 0.03)	0.90 (± 0.02)

Table 4. Sensitivity Analysis: Impact of Fairness Constraint (λ) on Scenario C Performance

Fairness Threshold (λ)	Fairness Index (F _I)	Strategic Quality Index (SQ _I)	Interpretation & Recommendation
0.70	0.78	0.92	High quality, but fairness too low; not recommended
0.80	0.85	0.91	Good balance, but fairness can improve further
0.85	0.90	0.90	Optimal balance for most SME contexts
0.90	0.93	0.88	Excellent fairness, minor quality trade-off; good for high-risk decisions
0.95	0.96	0.85	Maximum fairness, but notable quality impact; use cautiously

V. DISCUSSION

The findings within the simulation context suggest that systems lacking transparency may occasionally produce acceptable strategic outcomes, but with unstable performance and high variability, reflecting indicative performance patterns rather than guaranteed results. Scenario A’s metrics, while sometimes favorable, showed significant inconsistency (SD = 0.06–0.07), indicating the potential risks of black-box AI in SME decision-making. Scenario C’s performance in simulated scenarios indicates that integrating ethical governance with XAI can lead to more stable, predictable decision outcomes, maintaining low variance while achieving high overall performance. These observations should be interpreted as indicative patterns within simulation-based experiments rather than real-world certainties, emphasizing the need for cautious managerial interpretation (Birkstedt et al., 2023; Costa Melo et al., 2023).

The sensitivity analysis demonstrates that the governance threshold $\lambda = 0.85$ strikes the best balance between fairness and strategic quality in the simulation context. Still, this threshold should not be considered a universal standard for all SMEs. The inverted U-shaped relationship between fairness constraints and strategic quality suggests that both overly strict and overly lax governance can reduce decision quality, providing potential managerial guidance without

guaranteeing exact outcomes. Slight variations in Scenario C outcomes (0.02–0.03) further support the reliability of this integrative approach in simulation experiments and indicate that adaptation is necessary before application in real SME environments. Theoretically, the results reinforce a hybrid model in which XAI characteristics and ethical governance measures function cooperatively rather than in opposition (Birkstedt et al., 2023), and they suggest practical directions for SME AI managers (Costa Melo et al., 2023).

VI. CONCLUSION AND RECOMMENDATION

This study revisits the initial research objectives by examining how different AI governance approaches black-box AI, XAI, and XAI integrated with ethical governance affect strategic decision-making outcomes in SMEs within simulated scenarios. The results indicate that integrated XAI with ethical governance enhances fairness, transparency, and strategic quality, while highlighting the trade-offs in governance intensity (λ) to achieve optimal performance. From a theoretical perspective, the study contributes to responsible AI literature by providing a unified framework that links XAI characteristics and ethical governance in SME contexts. Methodologically, it demonstrates the value of simulation-based experimentation as a feasible alternative when real-world data are limited or risky to obtain, providing replicable and indicative performance patterns. Practically, the findings offer SME decision-makers actionable insights into implementing ethical AI governance to improve the quality of strategic decisions under resource constraints.

Beyond the immediate SME context, the framework underscores organizational learning and adaptation in technology-disrupted environments, emphasizing trial and error, reflection, and iterative improvement as key mechanisms for effective AI governance (Musrifah & Hasanah, 2025). Future research can extend these findings through longitudinal studies to capture evolving governance practices and ethical challenges across organizations. By linking ethics and performance from the start, the study highlights how AI can positively impact decision-making while fostering learning and capability development within SMEs. Moreover, these findings encourage managers to consider the contextual fit of governance strategies, suggesting that iterative adaptation is necessary to align AI implementation with organizational culture, strategy, and operational constraints.

REFERENCES

- Adam, N. A., & Alarifi, G. (2021). Innovation Practices for Survival of Small and Medium Enterprises (SMEs) in the COVID-19 Times: The Role of External Support. *Journal of Innovation and Entrepreneurship*, 10(1), 1–22. <https://doi.org/10.1186/s13731-021-00156-6>

- Ali, S., Abuhmed, T., El-Sappagh, S., Muhammad, K., Alonso-Moral, J. M., Confalonieri, R., Guidotti, R., Del Ser, J., Díaz-Rodríguez, N., & Herrera, F. (2023). Explainable Artificial Intelligence (XAI): What We Know and What Is Left to Attain Trustworthy Artificial Intelligence. *Information Fusion*, 99, 101805. <https://doi.org/10.1016/j.inffus.2023.101805>
- Alkaraan, F., Elmarzouky, M., Hussainey, K., & Venkatesh, V. G. (2023). Sustainable Strategic Investment Decision-Making Practices in UK Companies: The Influence of Governance Mechanisms on Synergy Between Industry 4.0 and Circular Economy. *Technological Forecasting and Social Change*, 187, 122187. <https://doi.org/10.1016/j.techfore.2022.122187>
- Arrieta, A. B., Díaz-Rodríguez, N., Del Ser, J., Bennetot, A., Tabik, S., Barbado, A., García, S., Gil-López, S., Molina, D., Benjamins, R., Chatila, R., & Herrera, F. (2019). Explainable Artificial Intelligence (XAI): Concepts, Taxonomies, Opportunities and Challenges Toward Responsible AI. *arXiv*. <http://arxiv.org/abs/1910.10045>
- Birkstedt, T., Minkkinen, M., Tandon, A., & Mäntymäki, M. (2023). AI Governance: Themes, Knowledge Gaps and Future Agendas. *Internet Research*, 33(7), 133–167. <https://doi.org/10.1108/intr-01-2022-0042>
- Casadei, R., Fortino, G., Pianini, D., Placuzzi, A., Savaglio, C., & Viroli, M. (2022). A Methodology and Simulation-Based Toolchain for Estimating Deployment Performance of Smart Collective Services at the Edge. *IEEE Internet of Things Journal*, 9(20), 20136–20148. <https://doi.org/10.1109/jiot.2022.3172470>
- Costa Melo, D. I., Queiroz, G. A., Alves Junior, P. N., Sousa, T. B. de, Yushimito, W. F., & Pereira, J. (2023). Sustainable Digital Transformation in Small and Medium Enterprises (SMEs): A Review on Performance. *Heliyon*, 9(3), e13908. <https://doi.org/10.1016/j.heliyon.2023.e13908>
- De Bruijn, H., Warnier, M., & Janssen, M. (2022). The Perils and Pitfalls of Explainable AI: Strategies for Explaining Algorithmic Decision-Making. *Government Information Quarterly*, 39(2), 101666. <https://doi.org/10.1016/j.giq.2021.101666>
- Diop, I., Abdul-Nour, G., & Komljenovic, D. (2021). Overview of Strategic Approach to Asset Management and Decision-Making. *International Journal of Engineering Research & Technology (IJERT)*, 10(6), 578–585. <https://www.ijert.org/overview-of-strategic-approach-to-asset-management-and-decision-making>
- Eitel-Porter, R. (2021). Beyond the Promise: Implementing Ethical AI. *AI and Ethics*, 1(1), 73–80. <https://doi.org/10.1007/s43681-020-00011-6>
- Fanelli, R. M. (2021). Barriers to Adopting New Technologies Within Rural Small and Medium Enterprises (SMEs). *Social Sciences*, 10(11), 430. <https://doi.org/10.3390/socsci10110430>
- Gamage, S. K. N., Ekanayake, E. M. S., Abeyrathne, G. A. K. N. J., Prasanna, R. P. I. R., Jayasundara, J. M. S. B., & Rajapakshe, P. S. K. (2020). A Review of Global Challenges and Survival Strategies of Small and Medium Enterprises (SMEs). *Economies*, 8(4), 79. <https://doi.org/10.3390/economies8040079>

- Hulsen, T. (2023). Explainable Artificial Intelligence (XAI): Concepts and Challenges in Healthcare. *AI*, 4(3), 652–666. <https://doi.org/10.3390/ai4030034>
- Langer, M., Oster, D., Speith, T., Hermanns, H., Kästner, L., Schmidt, E., Sesing, A., & Baum, K. (2021). What Do We Want From Explainable Artificial Intelligence (XAI)? – A Stakeholder Perspective on XAI and a Conceptual Model Guiding Interdisciplinary XAI Research. *Artificial Intelligence*, 296, 103473. <https://doi.org/10.1016/j.artint.2021.103473>
- Musrifah, F., & Hasanah, I. A. (2025). Ethical Implications of AI-Driven Recruitment: A Multi-Perspective Study on Bias and Transparency in Digital Hiring Platforms. *Journal of Management and Informatics*, 4(1), 599–616. <https://doi.org/10.51903/jmi.v4i1.140>
- ÓhÉigeartaigh, S. S., Whittlestone, J., Liu, Y., Zeng, Y., & Liu, Z. (2020). Overcoming Barriers to Cross-cultural Cooperation in AI Ethics and Governance. *Philosophy and Technology*, 33(4), 571–593. <https://doi.org/10.1007/s13347-020-00402-x>
- Akinrinola, O., Okoye, C. C., Ofodile, O. C., & Ugochukwu, C. E. (2024). Navigating and Reviewing Ethical Dilemmas in AI Development: Strategies for Transparency, Fairness, and Accountability. *GSC Advanced Research and Reviews*, 18(3), 050–058. <https://doi.org/10.30574/gscarr.2024.18.3.0088>
- Pratama, R. W., & Hutabarat, P. T. (2026). Comparison of the Harmony Search and Gravitational Search Algorithms on a Decision Tree for Predicting Focus Levels. *Jurnal Ilmiah Sistem Informasi*, 5(1), 412–424. <https://doi.org/10.51903/pyk6nr81>
- Putra, T. W. A., Setiawan, N. D., & Rusito, R. (2024). The Use of Machine Learning for Efficient Energy Management in Big Data-Based Computing Systems. *Journal of Technology Informatics and Engineering*, 3(3), 324–336. <https://doi.org/10.51903/jtie.v3i3.202>
- Raihan, A. (2024). A Review of the Digitalization of the Small and Medium Enterprises (SMEs) Toward Sustainability. *Global Sustainability Research*, 3(2), 1–16. <https://doi.org/10.56556/gssr.v3i2.695>
- Rodgers, W., Murray, J. M., Stefanidis, A., Degbey, W. Y., & Tarba, S. Y. (2023). An Artificial Intelligence Algorithmic Approach to Ethical Decision-Making in Human Resource Management Processes. *Human Resource Management Review*, 33(1), 100925. <https://doi.org/10.1016/j.hrmr.2022.100925>
- Sahoo, S. K., & Goswami, S. S. (2023). A Comprehensive Review of Multiple Criteria Decision-Making (MCDM) Methods: Advancements, Applications, and Future Directions. *Decision Making Advances*, 1(1), 25–48. <https://doi.org/10.31181/dma1120237>
- Sari, M., Irfan, I., Jufrizen, J., & Deli, L. (2020). The Testing Model of Financial Management Ability of Small and Medium Enterprises (SMEs). *Jurnal Reviu Akuntansi dan Keuangan*, 10(3), 584–601. <https://doi.org/10.22219/jrak.v10i3.13331>
- Settembre-Blundo, D., González-Sánchez, R., Medina-Salgado, S., & García-Muiña, F. E. (2021). Flexibility and Resilience in Corporate Decision Making: A New Sustainability-

- Based Risk Management System in Uncertain Times. *Global Journal of Flexible Systems Management*, 22, 107–132. <https://doi.org/10.1007/s40171-021-00277-7>
- Setyaningsih, S., Widjojo, R., & Kelle, P. (2024). Challenges and Opportunities in Sustainability Reporting: A Focus on Small and Medium Enterprises (SMEs). *Cogent Business & Management*, 11(1), 2298215. <https://doi.org/10.1080/23311975.2023.2298215>
- Speith, T. (2022). A Review of Taxonomies of Explainable Artificial Intelligence (XAI) Methods. *ACM International Conference Proceeding Series*, 2239–2250. <https://doi.org/10.1145/3531146.3534639>
- Trunk, A., Birkel, H., & Hartmann, E. (2020). On the Current State of Combining Human and Artificial Intelligence for Strategic Organizational Decision-Making. *Business Research*, 13(3), 875–919. <https://doi.org/10.1007/s40685-020-00133-x>
- Vasconcelos, H., Jörke, M., Grunde-Mclaughlin, M., Gerstenberg, T., Bernstein, M. S., & Krishna, R. (2023). Explanations Can Reduce Overreliance on AI Systems During Decision-Making. *Proceedings of the ACM on Human-Computer Interaction*, 7(1), 1–38. <https://doi.org/10.1145/3579605>
- Wahyuning, S., & Sudibyo, S. K. (2024). Leveraging Machine Learning for Talent Acquisition: Predicting High-Performance Candidates in Human Resource Management. *Journal of Management and Informatics*, 3(1), 87–104. <https://doi.org/10.51903/jmi.v3i1.44>
- Zamani, S. Z. (2022). Small and Medium Enterprises (SMEs) Facing an Evolving Technological Era: A Systematic Literature Review on the Adoption of Technologies in SMEs. *European Journal of Innovation Management*, 25(6), 735–757. <https://doi.org/10.1108/ejim-07-2021-0360>