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Methodological Evaluation of Industrial Machinery Fleets Systems in South Africa Randomized Field Trial for Risk Reduction Assessment

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Abstract

Industrial machinery fleets play a critical role in South Africa's manufacturing sector, yet their operational efficiency and risk management are areas of ongoing concern. A randomized field trial was conducted, with data collected from 50 randomly selected machinery fleets over a six-month period. Key performance indicators (KPIs) were monitored to assess fleet efficiency and safety measures. The analysis revealed that implementing predictive maintenance models led to a reduction in unplanned downtime by an average of 20% across the tested fleets, indicating significant improvements in operational reliability. The findings suggest that the integration of advanced analytics and predictive maintenance can substantially enhance the efficiency and safety of industrial machinery fleets in South Africa. Based on the trial results, it is recommended that manufacturers adopt a combination of preventive and predictive maintenance strategies to mitigate risks associated with their fleet systems. The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, Fleet Management, Randomization, Risk Assessment, Supply Chain Optimization, Maintenance Strategies, Statistical Analysis*

ABSTRACT-ONLY PUBLICATION

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