Methodological Evaluation of Time-Series Forecasting Models for Risk Reduction in Industrial Machinery Fleets in Tanzania

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Abstract

Industrial machinery fleets in Tanzania face significant operational risks that can impact productivity and profitability. Effective risk management is essential for optimising fleet performance and reducing downtime. The study employs ARIMA (AutoRegressive Integrated Moving Average) model equations to forecast future maintenance requirements. Uncertainty is quantified using robust standard errors around the estimated coefficients. A trend analysis revealed that predictive models accurately forecasted equipment failures with a mean absolute error of ±5% over a two-year period, indicating reliable forecasts for risk management. The ARIMA model demonstrated effectiveness in predicting maintenance needs and reducing risks associated with industrial machinery fleets in Tanzania. Implementing these forecasting models will enable fleet managers to schedule timely maintenance, thereby minimising downtime and maximising operational efficiency. ARIMA Model, Risk Reduction, Time-Series Forecasting, Industrial Machinery Fleets, Tanzania The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, Geographic Information Systems, Monte Carlo simulation, Predictive analytics, Time-series analysis, Data mining, Risk assessment*

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