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Time-Series Forecasting Model for Risk Reduction in Transport Maintenance Depots Systems in Uganda: A Methodological Evaluation

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Abstract

This study focuses on the optimization of transport maintenance depots in Uganda to reduce operational risks. A mixed-method approach was employed, integrating statistical modelling with field data collection. Time series analysis using an autoregressive integrated moving average (ARIMA) model was utilised to forecast future demands based on historical patterns. The ARIMA model predicted a reduction in maintenance costs of up to 15% by accurately forecasting demand fluctuations over the next two years, with an uncertainty range within ±2.5% confidence intervals. The study validated the effectiveness of the ARIMA model in reducing operational risks at transport maintenance depots in Uganda. Deployment of the model should be considered for further validation and implementation across multiple depots to achieve broader benefits. transport maintenance, risk reduction, time-series forecasting, ARIMA model, Ugandan depots The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Uganda, Geographic Information Systems (GIS), Time Series Analysis, Monte Carlo Simulation, Regression Analysis, Predictive Maintenance, Data Mining*

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