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Forecasting Risk Reduction in Transport Maintenance Depots Using Time-Series Models in Rwanda: An Evaluation Study

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Abstract

The efficiency of transport maintenance depots in Rwanda is crucial for maintaining road networks and ensuring safe travel conditions. However, there are challenges related to predicting future needs based on historical data. The methodology involves analysing historical data from Rwanda's transport maintenance depots using ARIMA (AutoRegressive Integrated Moving Average) model for forecasting future maintenance needs. Robust standard errors are used to assess the uncertainty in these forecasts. An analysis of the first year's data revealed a significant forecast error with a mean absolute percentage error of approximately 15%, indicating room for improvement in predictive models. ARIMA model forecasting showed promise but requires further refinement and validation through additional years' data to enhance its accuracy. Future research should explore machine learning techniques alongside ARIMA to potentially reduce forecast errors, thereby improving maintenance planning in Rwanda's transport sector. The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Rwanda, Geographic Information Systems (GIS), Maintenance Depot Management, Time-Series Analysis, Forecasting Models, Risk Assessment, Supply Chain Optimization*

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

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