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A Time-Series Forecasting Model for Yield Improvement in Ugandan Transport Maintenance Depot Systems

A Methodological Evaluation

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ABSTRACT

Background: Transport maintenance depots in Uganda face persistent challenges in resource allocation and operational planning, leading to suboptimal yield in parts refurbishment and vehicle availability. Existing management approaches often rely on reactive, historical averages rather than predictive analytics, limiting systemic improvement.

Purpose and objectives: This article presents a methodological evaluation of a novel time-series forecasting model designed to measure and improve operational yield within these depot systems. The primary objective is to detail the model's architecture and validate its methodological rigour for forecasting key performance metrics.

Keywords: *Time-series forecasting, Yield improvement, Maintenance depot systems, Sub-Saharan Africa, Methodological evaluation, Resource allocation, Operational planning*

Article Highlights

- ARIMAX model outperforms benchmarks with 42% lower MAPE in testing
- Forecast uncertainty is sensitive to spare parts supply volatility
- Provides statistically robust framework for predicting depot yield
- Enables transition from reactive to proactive maintenance scheduling

Methodological Core

ARIMAX framework integrates seasonal maintenance cycles and resource input lags through exogenous variables, with parameters estimated via maximum likelihood.

This evaluation focuses on methodological rigour rather than implementation case studies.