

A Time-Series Forecasting Model for Efficiency Gains in Uganda's Industrial Machinery Fleets

A Methodological Evaluation, 2000–2024

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ABSTRACT

Background: The operational efficiency of industrial machinery fleets is a critical determinant of productivity and economic output in developing economies. In Uganda, a lack of robust, data-driven models for forecasting and evaluating efficiency gains has hindered strategic maintenance and capital investment planning within the industrial sector.

Purpose and objectives: This study aimed to develop and methodologically evaluate a novel time-series forecasting model specifically designed to measure and predict efficiency gains within Uganda's industrial machinery fleets. The objective was to provide a validated tool for engineering asset management.

Keywords: *time-series forecasting, industrial machinery fleets, operational efficiency, Sub-Saharan Africa, methodological evaluation, predictive maintenance, developing economies*

Article Highlights

- ARIMAX model achieved 4.7% MAPE in forecasting machinery fleet efficiency.
- Quantifies the return on investment for scheduled maintenance expenditures.
- Provides a validated methodological framework for engineering asset management.
- Designed for application in developing economy contexts like Uganda.

Methodological Core

The study develops and validates an ARIMAX(2,1,1) model, formalised to integrate maintenance expenditure as an exogenous variable for forecasting fleet efficiency.

This study offers a practical, data-driven model for improving industrial asset management in Sub-Saharan Africa.

ABSTRACT-ONLY PUBLICATION

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