

Methodological Evaluation and Time-Series Forecasting for Efficiency Gains in Tanzania's Industrial Machinery Fleets

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ABSTRACT

Background: Industrial machinery fleets are critical capital assets in developing economies, yet systematic methodologies for evaluating their operational efficiency and forecasting performance gains are lacking. In Tanzania, ad-hoc maintenance and utilisation practices hinder productivity and lifecycle management.

Purpose and objectives: This study aimed to develop and validate a methodological framework for evaluating industrial machinery systems, with the core objective of constructing a robust time-series forecasting model to quantify potential efficiency gains.

Keywords: *Industrial machinery fleets, time-series forecasting, operational efficiency, Sub-Saharan Africa, maintenance optimisation, developing economies, performance measurement*

Article Highlights

- Develops a hybrid methodological framework for machinery fleet evaluation in a developing economy context.
- Validates an ARIMAX forecasting model using field data from Tanzanian industrial operators.
- Projects statistically significant efficiency gains from predictive, data-driven maintenance scheduling.
- Provides a tool for moving from descriptive analysis to predictive insight for capital assets.

Core Forecasting Model

The study employs an Autoregressive Integrated Moving Average model with exogenous variables (ARIMAX), estimated via maximum likelihood, to quantify potential efficiency gains from optimised maintenance.

This study transitions machinery management from reactive practices to evidence-based forecasting.

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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