

Multilevel Regression Analysis of Industrial Machinery Fleet Reliability for Maintenance Policy in Uganda, 2000–2026

Grace Akello¹|Isaac Mugisha^{2,3}|Patience Nalwoga¹
Moses Kato¹

Uganda National Council for Science and Technology (UNCST) • Kyambogo University, Kampala • Kampala International University (KIU)

Correspondence: gakello@yahoo.com

Received: 15 August 2001 | Accepted: 01 November 2001 | Published: 08 December 2001 | DOI:

[10.5281/zenodo.18973604](https://doi.org/10.5281/zenodo.18973604)

ABSTRACT

Background: The reliability of industrial machinery fleets is a critical determinant of productivity and economic growth in developing economies. In Uganda, systemic maintenance policy has historically been reactive, leading to high downtime and capital inefficiency. A rigorous, data-driven framework for evaluating fleet reliability to inform national policy is absent.

Purpose and objectives: This policy analysis article aims to develop and apply a multilevel regression modelling framework to quantify the reliability of industrial machinery fleets. The objective is to identify the key operational and policy-level factors influencing reliability to provide evidence for a shift towards predictive maintenance strategies.

Keywords: *Industrial machinery reliability, Maintenance policy, Multilevel regression analysis, Sub-Saharan Africa, Fleet management, System reliability, Uganda*

Article Highlights

- A 15.2% increase in MTBF is associated with greater predictive maintenance investment.
- Firm-level practices, not sectoral traits, are the primary drivers of fleet reliability.
- Multilevel regression isolates variance across machines, firms, and industrial sectors.
- Findings support a policy shift from reactive to predictive maintenance strategies.

Methodological Core

A three-level hierarchical linear model analyzes variance in Mean Time Between Failures across machines, firms, and sectors in Uganda's industrial fleet.

This analysis provides an evidence base for national industrial maintenance policy reform.

ABSTRACT-ONLY PUBLICATION

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

REQUEST FULL PAPER

 **Email:** info@parj.africa

Request your copy of the full paper today!

SUBMIT YOUR RESEARCH

**Are you a researcher in Africa? We
welcome your submissions!**

Join our community of African scholars and share
your groundbreaking work.

 **Submit at:** app.parj.africa



Scan to visit app.parj.africa

Open Access Scholarship from PARJ

Empowering African Research | Advancing Global
Knowledge