



Methodological Evaluation of Industrial Machinery Fleets in Tanzania Using Multilevel Regression Analysis for Cost-Effectiveness Assessment

Kosmas Kachamba^{1,2}, Simeon Gota^{2,3}, Nicholas Mbulawa^{2,4}

¹ Mkwawa University College of Education

² Nelson Mandela African Institution of Science and Technology (NM-AIST), Arusha

³ Department of Electrical Engineering, University of Dar es Salaam

⁴ Department of Mechanical Engineering, Mkwawa University College of Education

Published: 22 January 2010 | **Received:** 02 September 2009 | **Accepted:** 06 December 2009

Correspondence: kkachamba@hotmail.com

DOI: [10.5281/zenodo.18907554](https://doi.org/10.5281/zenodo.18907554)

Author notes

Kosmas Kachamba is affiliated with Mkwawa University College of Education and focuses on Engineering research in Africa.

Simeon Gota is affiliated with Department of Electrical Engineering, University of Dar es Salaam and focuses on Engineering research in Africa.

Nicholas Mbulawa is affiliated with Department of Mechanical Engineering, Mkwawa University College of Education and focuses on Engineering research in Africa.

Abstract

Industrial machinery fleets play a crucial role in optimising production processes within Tanzanian industries. The cost-effectiveness of these fleets is influenced by various factors including maintenance schedules, usage patterns, and operational efficiency. A multilevel regression model was employed to analyse fleet-level and industry-level factors affecting operational costs. The model incorporates fixed effects for individual machinery units nested within industries, with random intercepts accounting for unobserved heterogeneity at the industry level. The analysis revealed a significant interaction effect between maintenance schedules and usage patterns on cost-effectiveness, indicating that specific combinations of these factors yield better outcomes in certain sectors. This study provides a robust framework for assessing the cost-effectiveness of industrial machinery fleets in Tanzania, offering insights into optimising fleet management strategies. Future research should extend this analysis to include additional variables such as environmental impact and technological advancements to provide a more comprehensive evaluation. multilevel regression, industrial machinery, cost-effectiveness, maintenance schedules, usage patterns, Tanzania The maintenance outcome was modelled as $Y_i = \beta_0 + \beta_1 X_i + u_i + \epsilon_i$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: Sub-Saharan, multilevel, regression, econometrics, productivity, sustainability, logistics

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