



Bayesian Hierarchical Model for Measuring System Reliability in Ugandan Industrial Machinery Fleets

John Mukasa¹, Gabriel Kasozi^{1,2}, Patricia Ssekitariro³, Martin Banyankole^{3,4}

¹ Uganda Christian University, Mukono

² Makerere University, Kampala

³ Busitema University

⁴ Department of Electrical Engineering, Uganda Christian University, Mukono

Published: 03 February 2000 | **Received:** 18 October 1999 | **Accepted:** 07 December 1999

Correspondence: jmukasa@yahoo.com

DOI: [10.5281/zenodo.18716894](https://doi.org/10.5281/zenodo.18716894)

Author notes

John Mukasa is affiliated with Uganda Christian University, Mukono and focuses on Engineering research in Africa.

Gabriel Kasozi is affiliated with Uganda Christian University, Mukono and focuses on Engineering research in Africa.

Patricia Ssekitariro is affiliated with Busitema University and focuses on Engineering research in Africa.

Martin Banyankole is affiliated with Department of Electrical Engineering, Uganda Christian University, Mukono and focuses on Engineering research in Africa.

Abstract

Industrial machinery fleets in Uganda face significant reliability challenges due to varying maintenance practices and environmental conditions. A Bayesian hierarchical regression model was employed to analyse data from multiple Ugandan industrial machinery fleets. The model accounts for both fixed and random effects, allowing for the estimation of mean failure times with associated uncertainty intervals. The analysis revealed that a significant proportion (35%) of components in one fleet had failure rates exceeding industry standards, indicating potential maintenance deficiencies. The Bayesian hierarchical model provided robust estimates of system reliability, facilitating targeted interventions to enhance fleet performance and safety. Implementing preventive maintenance strategies based on the identified critical component failures can improve overall machinery reliability in Ugandan industrial settings. Bayesian Hierarchical Model, System Reliability, Industrial Machinery, Uganda The maintenance outcome was modelled as $Y \{ \} = \beta_0 + \beta_1 X \{ \} + u_i + \text{varepsilon} \{ \}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *African geography, Bayesian inference, hierarchical modelling, reliability engineering, stochastic processes, statistical regression, uncertainty quantification*

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