African Maintenance Engineering

Bayesian Hierarchical Model for Risk Reduction in Industrial Machinery Fleets of Kenya: An Analytical Study

Oscar Kamau[1], **Erick Ngugi**[1,2]

[1] Department of Mechanical Engineering, Maseno University

[2] Department of Electrical Engineering, Moi University

Published: 03 June 2005 | **Received:** 23 March 2005 | **Accepted:** 04 May 2005

Correspondence: okamau@outlook.com

DOI: 10.5281/zenodo.18705011

Author notes

Oscar Kamau is affiliated with Department of Mechanical Engineering, Maseno University and focuses on Engineering research in Africa.

Erick Ngugi is affiliated with Department of Mechanical Engineering, Maseno University and focuses on Engineering research in Africa.

Abstract

Industrial machinery fleets in Kenya face significant operational risks that can lead to costly downtime and reduced productivity. Existing risk assessment methodologies are often static and may not account for the dynamic nature of industrial environments. The study employs a Bayesian hierarchical model to analyse historical data from industrial machinery fleets across Kenya. This approach allows for the integration of various sources of uncertainty and variability, enabling more accurate risk predictions. Our analysis reveals that incorporating geographical and operational factors into the model significantly reduces prediction errors by up to 15%, offering a clearer picture of potential risks in different regions and under varying conditions. The Bayesian hierarchical model demonstrates its effectiveness in enhancing risk management strategies for industrial machinery fleets, particularly in terms of reducing uncertainty about future failures. Engineers and maintenance managers should adopt this model to improve decision-making processes regarding fleet planning, resource allocation, and predictive maintenance schedules. The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Kenya, Bayesian Hierarchical Models, Monte Carlo Simulations, Markov Chain Models, Risk Assessment, Industrial Engineering, Asset Management Systems*

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