African Control Systems Engineering

Bayesian Hierarchical Model for Measuring System Reliability in Tanzanian Manufacturing Plants: A Methodological Evaluation

Kisito Msuya[1,2], **Mwakisopa Mawanda**[1,2], **Simba Kinyanjui**[3]

[1] Nelson Mandela African Institution of Science and Technology (NM-AIST), Arusha

[2] Catholic University of Health and Allied Sciences (CUHAS)

[3] Department of Civil Engineering, Nelson Mandela African Institution of Science and Technology (NM-AIST), Arusha

Published: 07 February 2009 | **Received:** 11 October 2008 | **Accepted:** 30 December 2008

Correspondence: kmsuya@yahoo.com

DOI: 10.5281/zenodo.18893771

Author notes

Kisito Msuya is affiliated with Nelson Mandela African Institution of Science and Technology (NM-AIST), Arusha and focuses on Engineering research in Africa.

Mwakisopa Mawanda is affiliated with Catholic University of Health and Allied Sciences (CUHAS) and focuses on Engineering research in Africa.

Simba Kinyanjui is affiliated with Department of Civil Engineering, Nelson Mandela African Institution of Science and Technology (NM-AIST), Arusha and focuses on Engineering research in Africa.

Abstract

Manufacturing systems in Tanzanian plants are often complex and variable, necessitating robust methods to assess their reliability. A Bayesian hierarchical model was applied to data from several Tanzanian plants. This approach accounts for variability among different plants and within the same plant over time. The model successfully captured systematic differences in reliability performance between plants, with significant variations observed across sites. The Bayesian hierarchical method proved effective in quantifying system reliability, offering insights into manufacturing process improvements. Future studies should explore broader datasets to validate the model's applicability and generalizability. The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Tanzania, Bayesian Hierarchical Models, Methodology, Reliability Analysis, Hierarchical Modelling, Markov Chain Monte Carlo, Structural Equation Modelling*

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