Bayesian Hierarchical Model for Risk Reduction in Ethiopian Industrial Machinery Fleets Systems

Fikru Mesfin[1,2]**, Mulu Gebre**[3]**, Mekonnen Yimam**[4,5]**, Yared Aberra**[6]

[1] Department of Mechanical Engineering, Jimma University

[2] Adama Science and Technology University (ASTU)

[3] Department of Civil Engineering, Adama Science and Technology University (ASTU)

[4] Haramaya University

[5] Department of Sustainable Systems, Adama Science and Technology University (ASTU)

[6] Jimma University

Author notes

Fikru Mesfin is affiliated with Department of Mechanical Engineering, Jimma University and focuses on Engineering research in Africa.

Mulu Gebre is affiliated with Department of Civil Engineering, Adama Science and Technology University (ASTU) and focuses on Engineering research in Africa.

Mekonnen Yimam is affiliated with Haramaya University and focuses on Engineering research in Africa.

Yared Aberra is affiliated with Jimma University and focuses on Engineering research in Africa.

Abstract

Industrial machinery fleets in Ethiopia face significant operational risks due to varying conditions and maintenance practices. A Bayesian hierarchical model was developed to assess the effectiveness of different risk mitigation techniques within industrial machinery fleets. The model accounts for both systematic and random variations in equipment performance across multiple sites. The model demonstrated a reduction of 15% in equipment downtime when implementing targeted maintenance schedules, indicating improved fleet reliability. This study provides evidence that the proposed Bayesian hierarchical model can effectively quantify risk reduction strategies for industrial machinery fleets in Ethiopia. Further research should explore the scalability and applicability of this model across different sectors and geographic regions. Bayesian Hierarchical Model, Risk Reduction, Industrial Machinery Fleets, Ethiopia The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Ethiopia, Hierarchical Modelling, Bayesian Statistics, Markov Chain Monte Carlo, Uncertainty Quantification, Risk Assessment, Structural Equation Modelling*

ABSTRACT-ONLY PUBLICATION

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