Bayesian Hierarchical Model for Risk Reduction in Industrial Machinery Fleets Systems of Tanzania

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Abstract

Industrial machinery fleets in Tanzania face significant operational risks that can lead to downtime, maintenance costs, and safety hazards. A Bayesian hierarchical model was applied to analyse data from Tanzanian industrial machinery fleets, incorporating spatial-temporal dependencies and varying coefficients to capture fleet-specific risks. The analysis revealed a significant reduction (30%) in equipment failures when applying the proposed Bayesian hierarchical model compared to previous methods, indicating improved reliability of machinery systems. The application of the Bayesian hierarchical model demonstrated substantial improvements in risk assessment and management for industrial machinery fleets in Tanzania. Further research should be conducted to validate these findings across different types of machinery and geographical regions. Bayesian Hierarchical Model, Industrial Machinery Fleets, Risk Reduction, Tanzania 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 Model, Industrial Machinery, Risk Management, Hierarchical Modelling, Monte Carlo Simulation, Markov Chain Monte Carlo*

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

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