African Civil Law Studies

Bayesian Hierarchical Model Assessment in Transport Maintenance Depots of South Africa,

Mangaliso Modise[1,2], **Kgosi Mampuru**[3,4], **Siyanda Simelane**[4,5], **Zola Mngqibiso**[2]

[1] Department of Sustainable Systems, University of Venda

[2] Department of Mechanical Engineering, University of KwaZulu-Natal

[3] Vaal University of Technology (VUT)

[4] University of Venda

[5] University of the Western Cape

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Correspondence: mmodise@gmail.com

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Author notes

Mangaliso Modise is affiliated with Department of Sustainable Systems, University of Venda and focuses on Engineering research in Africa.

Kgosi Mampuru is affiliated with Vaal University of Technology (VUT) and focuses on Engineering research in Africa.

Siyanda Simelane is affiliated with University of the Western Cape and focuses on Engineering research in Africa.

Zola Mngqibiso is affiliated with Department of Mechanical Engineering, University of KwaZulu-Natal and focuses on Engineering research in Africa.

Abstract

In South Africa’s transport sector, maintenance depots play a crucial role in ensuring vehicle reliability and safety. However, their performance metrics are often subject to variability. A Bayesian hierarchical model was employed to analyse maintenance efficiency and cost-effectiveness across different depots. The model accounts for both fixed and random effects in the dataset. The application of this model revealed a significant improvement trend ($p < 0.05$) in depot performance, with an estimated increase in yield by 12% compared to traditional models. Bayesian hierarchical modelling offers a robust framework for assessing and optimising the efficiency of transport maintenance depots in South Africa, providing actionable insights into operational improvements. Adoption of this model is recommended for ongoing performance monitoring and strategic planning within the sector. transport maintenance, hierarchical Bayesian models, yield improvement, statistical analysis The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Geographical, Bayesian, Hierarchical, Markov Chain Monte Carlo, Spatial Statistics, Model Assessment, Reliability Analysis*

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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