Bayesian Hierarchical Model for Yield Improvement in Transport Maintenance Depots Systems in Kenya: A Methodological Evaluation

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Abstract

Transport maintenance depots (TMDs) play a crucial role in ensuring efficient vehicle operations in Kenya's road infrastructure. However, their performance and yield improvement remain underutilized. The methodology employed a Bayesian hierarchical model to analyse data from multiple TMDs, incorporating spatial and temporal variability. Model specifications were guided by prior knowledge and empirical observations. A key finding was that the inclusion of spatial autocorrelation significantly improved predictive accuracy in yield improvement estimates across different depots. The Bayesian hierarchical model demonstrated robustness and flexibility in assessing TMD performance, offering a methodological advancement for future research and practice. Adoption of this model could lead to more informed decision-making regarding maintenance strategies and resource allocation. The maintenance outcome was modelled as $Y\{\}=beta0+beta1X\{\}+ui+varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Kenya, Maintenance Depots, Bayesian Hierarchical Models, Methodology, Quality Control, Predictive Analytics, Reliability Engineering*

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