African Maintenance Engineering

Bayesian Hierarchical Model for Assessing System Reliability in Rwanda's Transport Maintenance Depots Systems

Hutu Habimana[1], **Mutakala Gasenga**[1,2], **Kabuga Umuhoza**[3,4], **Nkusi Nsengiyumva**[5]

[1] African Leadership University (ALU), Kigali

[2] Department of Civil Engineering, Rwanda Environment Management Authority (REMA)

[3] Department of Civil Engineering, University of Rwanda

[4] Department of Mechanical Engineering, Rwanda Environment Management Authority (REMA)

[5] University of Rwanda

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Correspondence: hhabimana@aol.com

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Author notes

Hutu Habimana is affiliated with African Leadership University (ALU), Kigali and focuses on Engineering research in Africa.

Mutakala Gasenga is affiliated with African Leadership University (ALU), Kigali and focuses on Engineering research in Africa.

Kabuga Umuhoza is affiliated with Department of Civil Engineering, University of Rwanda and focuses on Engineering research in Africa.

Nkusi Nsengiyumva is affiliated with University of Rwanda and focuses on Engineering research in Africa.

Abstract

Rwanda's transport maintenance depots play a critical role in ensuring vehicle reliability and safety within its road network. A Bayesian hierarchical model was developed to assess the reliability of transport maintenance depots. This approach incorporates uncertainty and allows for the estimation of parameters at multiple levels of hierarchy. The model revealed that 75% of depot systems exhibited high reliability, with significant variability across different vehicle types and maintenance protocols. The Bayesian hierarchical model effectively quantifies system reliability in Rwanda's transport maintenance depots, offering a robust framework for future maintenance interventions. Future studies should consider expanding the model to include additional factors such as environmental conditions and driver behaviour. The maintenance outcome was modelled as $Y\{\}=beta0+beta1\,X\{\}+ui+varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Bayesian statistics, Hierarchical modelling, Reliability engineering, System assessment, African transportation, Maintenance depots, Quality control*

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