



Multilevel Regression Analysis for Risk Reduction in Industrial Machinery Fleets Systems in Rwanda: An Engineering Perspective

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Abstract

Industrial machinery fleets play a critical role in Rwanda's industrial sector, contributing significantly to economic growth and productivity. A multilevel regression model will be employed to analyse data collected from multiple levels of the machinery fleet system, including equipment, operators, and maintenance practices. Analysis reveals a significant reduction ($p < .05$) in operational downtime attributed to improved preventive maintenance protocols. Multilevel regression analysis effectively identifies key factors influencing risk reduction within industrial machinery fleets. Implementing the identified preventive maintenance strategies is recommended for further reducing operational risks and enhancing fleet efficiency. Industrial Machinery, Risk Reduction, Multilevel Regression Analysis, Rwanda The maintenance outcome was modelled as $Y_i = \beta_0 + \beta_1 X_i + u_i + \epsilon_i$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, multilevel, regression, econometrics, stochastic, hierarchical, predictive*

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