



Methodological Evaluation of Manufacturing Systems in Kenyan Plants: Multilevel Regression Analysis for System Reliability Assessment

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Abstract

This study addresses a current research gap in Engineering concerning Methodological evaluation of manufacturing plants systems in Kenya: multilevel regression analysis for measuring system reliability in Kenya. The objective is to formulate a rigorous model, state verifiable assumptions, and derive results with direct analytical or practical implications. A structured analytical approach was used, integrating formal modelling with domain evidence. The results establish bounded error under perturbation, a convergent estimation process under stated assumptions, and a stable link between the proposed metric and observed outcomes. The findings provide a reproducible analytical basis for subsequent theoretical and applied extensions. Stakeholders should prioritise inclusive, locally grounded strategies and improve data transparency. Methodological evaluation of manufacturing plants systems in Kenya: multilevel regression analysis for measuring system reliability, Kenya, Africa, Engineering, comparative study This work contributes a formal specification, transparent assumptions, and mathematically interpretable claims. The maintenance outcome was modelled as $Y = \beta_0 + \beta_1 X + u + \epsilon$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: Kenyan, Manufacturing Systems, Multilevel Analysis, Reliability Assessment, Regression Techniques, Statistical Methods, Geographic Information Systems

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