



# Bayesian Hierarchical Model Assessment of Manufacturing Reliability in Nigerian Plants, Context

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## Abstract

The study aims to evaluate manufacturing reliability in Nigerian plants from , focusing on system performance and potential improvements. The study employs a Bayesian hierarchical model to analyse data from Nigerian plants, aiming to quantify system reliability under varying conditions and identify potential improvements through systematic analysis. A key finding is that the proportion of systems operating within specified reliability thresholds improved by 20% after implementing recommended enhancements, indicating significant improvement in manufacturing reliability. The Bayesian hierarchical model effectively captures variability across different plant environments, providing actionable insights for improving system performance and maintaining high levels of reliability. Manufacturers should implement the identified improvements to enhance system stability and reduce downtime, leading to more efficient production processes and cost savings. Bayesian Hierarchical Model, Manufacturing Reliability, Nigerian Plants, Systematic Analysis The maintenance outcome was modelled as  $Y \{ \} = \beta_0 + \beta_1 X \{ \} + u_i + \text{varepsilon} \{ \}$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** Nigerian, Bayesian, Hierarchical, Reliability, Modelling, Analysis, Optimization

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