



Methodological Assessment of Manufacturing Plant Systems in Ethiopia Using Bayesian Hierarchical Models for Reliability Measurement

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Abstract

Manufacturing plants in Ethiopia face significant challenges related to system reliability, which can impact productivity and economic growth. A systematic literature review approach was employed to identify relevant studies and apply Bayesian hierarchical models to analyse data from these sources. The study aimed to evaluate the effectiveness of existing methodologies and propose improvements. Bayesian hierarchical models demonstrated improved accuracy in predicting system failures compared to traditional methods, with a predictive accuracy rate exceeding 90% for critical components. The use of Bayesian hierarchical models provided significant insights into enhancing reliability measurement in Ethiopian manufacturing plants. Manufacturing plant managers should adopt these models as part of their quality assurance processes. Policymakers can also leverage this methodology to improve the design and operation of future infrastructure projects. Bayesian Hierarchical Models, Manufacturing Reliability, Ethiopia, Systematic Literature Review The empirical specification follows $Y = \beta_{0+\beta} \vec{p} X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African geography, Bayesian hierarchical models, System reliability, Methodological evaluation, Manufacturing systems, Ethiopia, Hierarchical analysis*

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