African Infrastructure Planning (Technical focus)

Bayesian Hierarchical Model Evaluation for Yield Improvement in Tanzanian Manufacturing Plants Systems

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Abstract

Manufacturing systems in Tanzania have experienced varying levels of efficiency, influenced by a multitude of factors including resource availability and operational management. A Bayesian hierarchical model was developed, incorporating data from multiple sites within Tanzania's manufacturing sector. This approach accounts for both site-specific variations and overall system performance variability. The analysis revealed a significant improvement trend in yield across the evaluated plants (average increase of 12% with a 95% credible interval of [8%, 16%]). Bayesian hierarchical models provide robust insights into manufacturing efficiency, offering detailed uncertainty estimates that enhance decision-making processes. Manufacturing managers should consider implementing these models to better understand yield dynamics and optimise operational strategies. manufacturing systems, Bayesian hierarchical model, yield improvement, Tanzania The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Bayesian statistics, hierarchical modelling, Markov Chain Monte Carlo, spatial analysis, econometrics, resource allocation, predictive analytics*

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