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Bayesian Hierarchical Model for Yield Improvement in Nigerian Manufacturing Plants Systems

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Abstract

Manufacturing plants in Nigeria face significant yield variability due to various operational inefficiencies. A Bayesian hierarchical model was developed to account for the hierarchical structure of data across multiple plants, incorporating process variables and random effects. Uncertainty in predictions is quantified using robust standard errors. The model identified specific processes contributing 20% to overall yield variability, allowing targeted interventions. Bayesian hierarchical modelling provides a nuanced approach to understanding and improving manufacturing yields in Nigeria. Implement process optimization based on the findings of this study for sustainable yield improvement. manufacturing systems, Bayesian hierarchical model, yield improvement, Nigerian plants The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Bayesian statistics, hierarchical modelling, yield variability, manufacturing systems, Nigeria, quality control, econometrics*

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This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

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