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Bayesian Hierarchical Model for Measuring Adoption Rates in Process-Control Systems in Ghana: A Methodological Evaluation

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Abstract

This Data Descriptor evaluates a Bayesian hierarchical model for measuring adoption rates of process-control systems in Ghana's manufacturing sector. A Bayesian hierarchical model was applied to analyse data from a survey conducted across multiple industries in Ghana. The model incorporates uncertainty through robust standard errors, providing confidence intervals for predicted adoption rates. The analysis revealed significant variation in adoption rates between different sectors and regions of Ghana, with some industries showing adoption rates exceeding 80%. The Bayesian hierarchical model successfully accounted for the heterogeneity observed across diverse industrial settings, offering a nuanced understanding of system adoption dynamics in Ghana's manufacturing sector. Future research should focus on validating these findings through longitudinal data collection and exploring potential interventions to increase overall adoption rates. Bayesian Hierarchical Model, Process-Control Systems, Adoption Rates, Manufacturing Sector, Ghana The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Ghana, Bayesian hierarchical model, adoption rates, process control, methodology, statistical inference, spatial analysis*

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