Bayesian Hierarchical Model for Measuring Adoption Rates in Nigerian Power-Distribution Equipment Systems

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Published: 27 May 2011 | **Received:** 05 February 2011 | **Accepted:** 05 April 2011

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DOI: 10.5281/zenodo.18930456

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Abstract

In Nigeria, power-distribution equipment systems (PDES) play a critical role in ensuring reliable electricity supply to residential and industrial consumers. Despite their importance, adoption rates of these PDES are often suboptimal due to various socio-economic factors. A Bayesian hierarchical model was employed to analyse data from multiple PDES in Nigeria. The BHM accounts for spatial heterogeneity, incorporating regional specific effects to capture variations in adoption rates between different areas. Uncertainty quantification was achieved through robust standard errors and credible intervals generated by the model. The analysis revealed a significant variation in adoption rates across regions, with urban areas showing higher adoption compared to rural settings. Economic conditions were found to be a key determinant of adoption rates, particularly among lower-income households who face greater challenges accessing PDES. This study provides insights into the factors influencing the adoption of power-distribution equipment systems in Nigeria using sophisticated statistical modelling techniques. Policy-makers should consider targeting areas with low adoption rates and provide financial incentives or subsidies to promote wider adoption, especially among economically disadvantaged regions. Bayesian Hierarchical Model, Power-Distribution Equipment Systems, Adoption Rates, Nigeria The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Nigerian, Bayesian, Hierarchical, Adoption, Model, Quantitative, Analysis*

ABSTRACT-ONLY PUBLICATION

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