



Methodological Evaluation of Power-Distribution Equipment Systems in Nigeria: Quasi-Experimental Design for System Reliability Assessment

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Abstract

Power distribution equipment (PDE) systems in Nigeria face significant reliability challenges due to infrastructure inadequacies and operational inefficiencies. A mixed-methods approach combining quantitative data analysis with qualitative case studies was employed. The study utilised a regression discontinuity design (RDD) to assess the impact of power distribution upgrades in rural areas compared to non-upgraded regions. The RDD analysis revealed that upgrading PDE systems significantly improved system reliability by 25% in the experimental group, with a 95% confidence interval for the effect size being between 18% and 34%. The quasi-experimental design provided robust evidence of the positive impact of power distribution upgrades on system reliability. Further research should explore scalability of these findings to other regions in Nigeria, with a focus on policy recommendations for infrastructure development. Power Distribution Equipment Systems, Regression Discontinuity Design, System Reliability Assessment The maintenance outcome was modelled as $Y_i = \beta_0 + \beta_1 X_i + u_i + \epsilon_i$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: Nigerian, power-distribution, reliability, methodology, assessment, systems, engineering

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