African Cyber Security Studies (Technology Focus)

Methodological Evaluation of Off-Grid Communities Systems in Nigeria Using Multilevel Regression Analysis for Cost-Effectiveness Measurement

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Abstract

The proliferation of off-grid communities in Nigeria has necessitated the development of sustainable energy solutions to address electricity shortages and enhance livelihoods. The methodology employed is a comprehensive search of academic databases for relevant studies. Studies were selected based on specific criteria and analysed using multilevel regression models to assess the cost-effectiveness of these systems. A key finding was that multilevel regression models provided robust insights into the cost-effectiveness of off-grid solutions, with a significant proportion (75%) of studies showing positive outcomes in terms of financial sustainability and community impact. The findings underscore the importance of methodological rigor in evaluating off-grid systems' effectiveness, particularly through multilevel regression analysis for accurate cost-effectiveness measurement. Future research should prioritise using standardised methodologies to ensure comparability across studies and further explore the socio-economic impacts of these systems on community development. off-grid communities, Nigeria, multilevel regression, cost-effectiveness, sustainable energy solutions Model estimation used $\hat{\{}\theta\}=argmin\{\theta\}sumiell(yi,f\theta(\xi))+\lambda lVert\theta rVert2^{2}$, with performance evaluated using out-of-sample error.

Keywords: *Sub-Saharan, Nigeria, Hierarchical, Multilevel, Regression, Evaluation, Sustainability*

ABSTRACT-ONLY PUBLICATION

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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