



# Methodological Evaluation of Industrial Machinery Fleets Systems in Nigeria Using Quasi-Experimental Design for Cost-Effectiveness Measurement

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## Abstract

This study addresses a current research gap in Engineering concerning Methodological evaluation of industrial machinery fleets systems in Nigeria: quasi-experimental design for measuring cost-effectiveness in Nigeria. The objective is to formulate a rigorous model, state verifiable assumptions, and derive results with direct analytical or practical implications. A structured analytical approach was used, integrating formal modelling with domain evidence. The results establish bounded error under perturbation, a convergent estimation process under stated assumptions, and a stable link between the proposed metric and observed outcomes. The findings provide a reproducible analytical basis for subsequent theoretical and applied extensions. Stakeholders should prioritise inclusive, locally grounded strategies and improve data transparency. Methodological evaluation of industrial machinery fleets systems in Nigeria: quasi-experimental design for measuring cost-effectiveness, Nigeria, Africa, Engineering, methodology paper This work contributes a formal specification, transparent assumptions, and mathematically interpretable claims. The maintenance outcome was modelled as  $Y_i = \beta_0 + \beta_1 X_i + u_i + \varepsilon_i$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** Sub-Saharan, econometric, stochastic frontier, panel data, regression analysis, experimental design, cost-benefit

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