



Quasi-Experimental Design Assessment of Industrial Machinery Fleet Efficiency in Ghana

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Abstract

This study addresses a current research gap in Engineering concerning Methodological evaluation of industrial machinery fleets systems in Ghana: quasi-experimental design for measuring efficiency gains in Ghana. 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 Ghana: quasi-experimental design for measuring efficiency gains, Ghana, Africa, Engineering, case study This work contributes a formal specification, transparent assumptions, and mathematically interpretable claims. The maintenance outcome was modelled as $Y = \beta_0 + \beta_1 X + u + \varepsilon$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: Ghanaian, Quasi-experimental, Design, Evaluation, Fleet, Efficiency, Methodology

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