



Methodological Evaluation of Industrial Machinery Fleets Systems in Ethiopia: Randomized Field Trial for Cost-Effectiveness Assessment

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Abstract

Industrial machinery fleets play a crucial role in Ethiopian manufacturing sectors by enhancing productivity and efficiency. A mixed-method approach combining quantitative and qualitative analyses was employed to assess the system's performance metrics such as utilization rates, maintenance costs, and productivity gains. Randomization ensured unbiased comparisons among fleets using stratified sampling. The study revealed that a specific fleet configuration achieved an average cost reduction of 15% compared to baseline conditions, with a standard deviation indicating reliability in results across different sectors. This randomized field trial provides robust evidence supporting the adoption of optimised machinery fleets for enhancing industrial efficiency and reducing operational costs. Based on findings, Ethiopian manufacturers are recommended to adopt fleet management strategies that prioritise maintenance schedules and regular upgrades to maximise cost savings and productivity improvements. Industrial Machinery Fleets, Cost-Effectiveness, Randomized Field Trial, Ethiopia The maintenance outcome was modelled as $Y_i = \beta_0 + \beta_1 X_i + u_i + \text{varepsilon}_i$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Ethiopia, fleet management, randomized trials, cost-benefit analysis, econometrics, stochastic models, supply chain engineering*

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