



# Methodological Evaluation of Manufacturing Plant Systems in Uganda Using Difference-in-Differences for System Reliability Analysis

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## Abstract

The reliability of manufacturing plant systems in Uganda is critical for economic development but remains poorly understood due to data limitations and methodological challenges. The study utilised DiD methodology to analyse pre- and post-intervention data from selected manufacturing sites. A specific treatment group received upgrades while a control group did not. Data on system performance metrics were collected using standardised protocols. In the treated group, there was an observed improvement in mean reliability scores by 25% compared to the untreated group ( $p < 0.01$ ), highlighting significant gains from the upgrade interventions. The DiD model effectively captured changes attributable to the upgrades, demonstrating its utility for evaluating system reliability in manufacturing settings within Uganda. Future research should expand this study to include more sites and longer-term follow-up periods to validate findings. Policy recommendations could focus on prioritising regions with lower initial performance levels for similar interventions. 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:** *Manufacturing Systems, Diagnostics, Reliability Engineering, Econometrics, Development Studies, System Dynamics, Africa*

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