

# A Quasi-Experimental Evaluation of Efficiency Gains in Rwanda's Industrial Machinery Fleet Systems

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## ABSTRACT

**Background:** Industrial machinery fleet management is a critical determinant of productivity and project delivery in developing economies. However, rigorous, evidence-based evaluations of systemic efficiency interventions within this sector are scarce, particularly in sub-Saharan contexts.

**Purpose and objectives:** This study aimed to quantify the causal impact of a structured maintenance and telematics intervention on the operational efficiency of selected industrial machinery fleets. The primary objective was to isolate and measure efficiency gains attributable to the intervention using a quasi-experimental design.

**Keywords:** *quasi-experimental design, efficiency gains, industrial machinery, fleet management systems, Sub-Saharan Africa*

### Article Highlights

- Difference-in-differences design isolates causal impact of maintenance and telematics intervention.
- Treatment group showed 18.4% efficiency gain in availability, utilisation, and MTBF.
- Findings robust to multiple model specifications with cluster-robust inference.
- Study addresses evidence gap for systemic interventions in Sub-Saharan contexts.

### Core Methodology

A quasi-experimental difference-in-differences design compared treatment and control groups of heavy equipment from construction and mining sectors, using a composite efficiency metric.

*This study provides causal evidence for operational efficiency gains from structured technological interventions.*

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