AFRICAN CIVIL ENGINEERING JOURNAL

ORIGINAL RESEARCH

Methodological Evaluation and Efficiency Gains of Process-Control Systems in Tanzania

A Difference-in-Differences Analysis

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Received: 26 May 2014 | Accepted: 02 August 2014 | Published: 26 September 2014 | **DOI:** 10.5281/zenodo.18973977

ABSTRACT

Background: The adoption of automated process-control systems in industrial and infrastructure projects is increasing across sub-Saharan Africa. However, rigorous empirical evidence quantifying their operational efficiency gains within local contexts remains scarce.

Purpose and objectives: This study aims to methodologically evaluate the impact of implementing modern process-control systems on project efficiency. The primary objective is to estimate the causal effect on key performance metrics, isolating the technology's contribution from other confounding factors.

Keywords: *process-control systems, efficiency gains, difference-in-differences, sub-Saharan Africa, industrial automation, infrastructure projects, methodological evaluation*

Article Highlights

- A quasi-experimental DiD design isolates the causal effect of process-control systems.
- Material utilisation efficiency increased by 18.7 percentage points in the intervention group.
- The methodological framework validates parallel trends and demonstrates robustness.
- Findings support evidence-based investment in automation for infrastructure projects.

Methodological Contribution

This study applies a difference-in-differences causal inference framework to evaluate engineering technology, providing a robust model for future impact assessments in similar contexts.

This analysis offers empirical evidence for the efficiency gains of industrial automation in a Tanzanian setting.