

Comparative Evaluation of Process-Control System Methodologies

A Randomised Field Trial on Cost-Effectiveness in Tanzanian Industrial Infrastructure

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ABSTRACT

Background: The selection of process-control system methodologies for industrial infrastructure in developing economies is often based on theoretical models or vendor specifications, with limited empirical evidence from field trials to guide cost-effectiveness decisions.

Purpose and objectives: This study aimed to empirically compare the cost-effectiveness of three prevalent process-control system methodologies—centralised, distributed, and hybrid architectures—within the context of industrial infrastructure projects.

Keywords: *Process-control systems, Cost-effectiveness analysis, Randomised field trial, Industrial infrastructure, Sub-Saharan Africa*

Article Highlights

- First randomised field-trial evidence for process-control systems in African industrial infrastructure.
- Distributed architectures showed superior cost-effectiveness over centralised approaches.
- Hybrid methodologies displayed intermediate performance with higher cost variability.
- Findings challenge vendor-driven selection with empirical, context-specific data.

Methodological Note

Cost-effectiveness was measured via a generalised linear model analysing CAPEX, OPEX, and system uptime across randomly assigned project sites.

This trial provides actionable evidence for infrastructure planning in developing economies.

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

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