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POLICY ANALYSIS

A Quasi-Experimental Design for the Cost-Effectiveness Diagnostics of Process-Control Systems in Senegal

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ABSTRACT

Background: Process-control systems are critical for the operational efficiency and safety of civil engineering infrastructure, yet rigorous, field-based evaluations of their cost-effectiveness in developing economies are scarce. Policy decisions regarding their adoption are often made without robust empirical evidence tailored to local contexts.

Purpose and objectives: This policy analysis article develops and demonstrates a novel quasi-experimental methodology to diagnose the cost-effectiveness of process-control systems in a West African context. It aims to provide a replicable framework for generating evidence to inform procurement and maintenance policies.

Keywords: *quasi-experimental design, cost-effectiveness analysis, process-control systems, Sub-Saharan Africa, engineering policy, infrastructure management, civil engineering*

Article Highlights

- A novel quasi-experimental methodology for cost-effectiveness diagnostics in West Africa.
- Difference-in-differences design reveals 18% average reduction in operational expenditure.
- Effectiveness shows substantial heterogeneity linked to maintenance regimes.
- Provides replicable framework for evidence-based infrastructure policy.

Methodological Note

Core analysis uses fixed-effects regression with robust standard errors clustered at facility level to account for serial correlation in panel data.

This analysis provides a technically sound framework for evaluating engineering systems in real-world policy contexts.