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Methodological Evaluation and Reliability Assessment of Process-Control Systems in Senegal

A Difference-in-Differences Approach

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ABSTRACT

Background: Process-control systems are critical for infrastructure and industrial operations, yet rigorous methodological frameworks for evaluating their reliability in developing contexts are lacking. Existing assessments often rely on cross-sectional data, failing to account for temporal changes and confounding factors.

Purpose and objectives: This study aims to develop and apply a robust quasi-experimental methodology to evaluate the causal impact of modernising process-control systems on their operational reliability within a West African context.

Keywords: *process-control systems, reliability assessment, difference-in-differences, Sub-Saharan Africa, methodological evaluation, industrial automation, developing economies*

Article Highlights

- Applies a quasi-experimental DiD framework to evaluate engineering system performance.
- Finds a significant 15-point causal improvement in reliability from system modernisation.
- Validates the parallel trends assumption using pre-intervention panel data.
- Advocates for causal methodologies in infrastructure and industrial assessments.

Methodological Contribution

This study demonstrates the rigorous application of a difference-in-differences model to isolate the causal effect of a technological intervention on process-control system reliability in a developing economy context.

This article presents a causal methodology for engineering system evaluation.