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Comparative Evaluation of Process-Control System Methodologies for Risk Reduction

A Randomised Field Trial in Uganda

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ABSTRACT

Background: Process-control systems are critical for mitigating operational risks in structural engineering projects, yet there is a paucity of field-based evidence comparing the efficacy of different methodological approaches in low-resource construction environments.

Purpose and objectives: This study aimed to empirically compare the risk reduction performance of two distinct process-control system methodologies—a prescriptive checklist-based system and a performance-based dynamic monitoring system—within live construction projects.

Keywords: *Process-control systems, Randomised controlled trial, Risk reduction, Sub-Saharan Africa, Structural engineering, Comparative methodology, Field-based evaluation*

Article Highlights

- Performance-based dynamic monitoring reduced hazards by 38.2% versus 22.7% for prescriptive checklists.
- Treatment effect remained statistically significant ($p < 0.01$) after controlling for project variables.
- Study provides first comparative, randomised field evidence for process-control methodologies in this context.

Methodological Note

A mixed-effects model with site-level clustering was used to analyse hazard reduction across multiple infrastructure sites in a randomised field trial.

This trial offers empirical evidence for optimising risk management in low-resource construction environments.

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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