AFRICAN STRUCTURAL ENGINEERING

METHODOLOGY PAPER

Randomised Field Trial Methodology for Evaluating Power-Distribution Equipment Adoption in South Africa

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ABSTRACT

Background: The adoption of new power-distribution equipment in South Africa is critical for grid modernisation and reliability, yet robust methodologies for evaluating real-world adoption rates by engineering teams are lacking. Current evaluations often rely on self-reported survey data or controlled laboratory tests, which fail to capture the complex socio-technical factors influencing deployment decisions in the field.

Purpose and objectives: This article presents a novel methodological framework for conducting a randomised field trial (RFT) specifically designed to measure the adoption rates of new power-distribution equipment, such as compact substations or fault-passing switches, by municipal and utility engineers. The objective is to provide a rigorous, evidence-based evaluation protocol that isolates the causal effect of equipment characteristics on adoption.

Keywords: *Randomised controlled trial, Power-distribution networks, Technology adoption, Sub-Saharan Africa, Field experiment, Grid modernisation, Implementation science*

Article Highlights

- Proposes a novel randomised field trial (RFT) framework for evaluating equipment adoption.
- Clusters municipalities by size and capacity for robust, causally interpretable results.
- Employs a linear probability model with clustered standard errors for primary analysis.
- Pilot simulation confirms the design is powered to detect practically significant effects.

Methodological Innovation

The framework adapts RCT principles to the complex socio-technical context of municipal engineering teams, using verified procurement data as the primary adoption metric.

This article presents a methodological framework; empirical results from a completed trial are not included.