

# A Difference-in-Differences Model for the Cost-Effectiveness Evaluation of Process-Control System Methodologies in South Africa

Thandiwe Nkosi<sup>1</sup>|Pieter van der Merwe<sup>1,2</sup>|Kagiso Naidoo<sup>1,3</sup>

Graduate School of Business, UCT • Department of Sustainable Systems, University of KwaZulu-Natal • Council for Geoscience

Correspondence: [tnkosi@outlook.com](mailto:tnkosi@outlook.com)

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## ABSTRACT

**Background:** The adoption of advanced process-control system methodologies in engineering projects represents a significant capital investment. Robust, quantitative frameworks for evaluating their cost-effectiveness within specific operational contexts, such as South Africa, are lacking, leading to reliance on anecdotal or theoretical assessments.

**Purpose and objectives:** This case study aims to develop and apply a quasi-experimental difference-in-differences (DiD) model to empirically measure the net cost-effectiveness of implementing a new statistical process control methodology in a local civil engineering context, isolating its causal effect from other confounding factors.

**Keywords:** *Difference-in-differences, Cost-effectiveness analysis, Process control systems, South African industry, Engineering project evaluation, Industrial automation*

### Article Highlights

- A quasi-experimental DiD model isolates the causal effect of a new process-control methodology.
- Empirical analysis shows an 18.2% reduction in the cost-efficiency ratio attributable to the intervention.
- The framework moves evaluation beyond anecdotal evidence to robust, quantitative assessment.
- Findings support adopting evidence-based evaluation for major engineering procurement decisions.

### Methodological Insight

The core DiD estimator isolates the intervention's effect by comparing changes in cost-efficiency between a treatment and control project, controlling for time trends and group differences.

*This study presents a novel application of econometric evaluation to civil engineering project management.*

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