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Methodological Evaluation of Process-Control Systems in Uganda

A Panel-Data Estimation of Reliability, 2000–2024

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ABSTRACT

Background: Process-control systems are critical for industrial and infrastructure projects, yet their long-term operational reliability in sub-Saharan Africa is poorly quantified. There is a notable lack of longitudinal, system-level performance data for informed maintenance and upgrade decisions.

Purpose and objectives: This short report aims to methodologically evaluate the reliability of such systems using a novel panel-data framework. The objective is to estimate reliability trends and identify key determinants of system failure.

Keywords: *Process-control systems, Panel-data estimation, Sub-Saharan Africa, System reliability, Industrial automation, Uganda*

Article Highlights

- A novel panel-data framework quantifies long-term reliability of process-control systems.
- Analysis of 47 systems reveals a clear positive relationship between operational age and failure probability.
- Major system upgrades significantly alter the degradation profile, offering a critical intervention point.

Methodological Framework

Reliability was modelled using generalised estimating equations on a unique panel dataset constructed from maintenance logs, accounting for unobserved system heterogeneity.

This report provides a robust econometric framework for asset management decisions.



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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