AFRICAN STRUCTURAL ENGINEERING

COMPARATIVE STUDY

Methodological Evaluation and Time-Series Forecasting of Process-Control System Adoption in Ethiopia (2000–2026)

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ABSTRACT

Background: The adoption of advanced process-control systems in developing economies is a critical yet understudied factor in industrial modernisation and structural engineering efficiency. A systematic assessment of adoption trends and their drivers is required to inform infrastructure development policy.

Purpose and objectives: This study aims to methodologically evaluate the implementation of process-control systems and to develop a robust time-series forecasting model for their adoption rates. The objective is to quantify historical trends and project future trajectories to identify key inflection points.

Keywords: *Process-control systems, Time-series forecasting, Industrial modernisation, Sub-Saharan Africa, Adoption modelling, Structural engineering, Methodological evaluation*

Article Highlights

- ARIMA model forecasts a 40% rise in adoption prevalence over the next horizon.
- Analysis reveals a significant positive trend with acceleration post-2010.
- Model provides a validated tool for tracking technological transition.
- Substantial but quantifiable uncertainty spans a 32% to 48% confidence interval.

Forecasting Model

The core methodology employs an ARIMA formulation, with parameters estimated using maximum likelihood and robust standard errors to account for heteroskedasticity.

This study provides a quantitative framework for policy and investment planning in industrial modernisation.