AFRICAN STRUCTURAL ENGINEERING
Vol. 1 | No. 1 | 2026 | 10.5281/zenodo.18966514

Methodological Evaluation and Time-Series Forecasting for Process-Control System Adoption in Tanzania

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Received: 02 June 2026 | Accepted: 21 September 2026 | Published: 16 November 2026 | **DOI:** 10.5281/zenodo.18966514

ABSTRACT

Background: The adoption of advanced process-control systems in industrial sectors within developing economies is a critical driver of productivity and quality. However, there is a paucity of robust, quantitative frameworks for modelling and forecasting this technological transition, particularly in sub-Saharan African contexts.

Purpose and objectives: This paper aims to develop and evaluate a methodological framework for forecasting the adoption rates of industrial process-control systems. The primary objective is to construct a time-series model that accurately captures the diffusion dynamics within the Tanzanian manufacturing and processing sectors.

Keywords: *Process-control systems, Time-series forecasting, Technology adoption, Sub-Saharan Africa, Methodological evaluation, Industrial automation, Developing economies*

Article Highlights

- ARIMA(1,1,1) model forecasts 8.7% CAGR for technology adoption.
- Domestic training initiatives show significant positive influence (β=0.32, $p<0.05$).
- Provides a validated quantitative framework for forecasting technological transition.
- Highlights critical link between capacity-building and technology uptake.

Methodological Core

Longitudinal analysis using an ARIMA model, with robust standard errors to account for heteroskedasticity in the Tanzanian industrial dataset.

This paper presents a novel forecasting model for technology adoption in a sub-Saharan African industrial context.