



Methodological Evaluation of Process-Control Systems in Uganda Using Time-Series Forecasting for System Reliability Analysis

Tumwebaze Namukonde¹, Kizza Musoke^{1,2}

¹ Uganda National Council for Science and Technology (UNCST)

² Makerere University Business School (MUBS)

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Correspondence: tnamukonde@aol.com

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Author notes

Tumwebaze Namukonde is affiliated with Uganda National Council for Science and Technology (UNCST) and focuses on Engineering research in Africa.

Kizza Musoke is affiliated with Makerere University Business School (MUBS) and focuses on Engineering research in Africa.

Abstract

Process-control systems are critical for maintaining quality and efficiency in manufacturing processes. In Uganda, these systems play a vital role in various industries but their effectiveness varies significantly. The study employs time-series forecasting techniques such as ARIMA (Autoregressive Integrated Moving Average) to analyse historical data from manufacturing processes. Robust standard errors are used to account for model uncertainty. A significant proportion, approximately 42%, of the forecasted values deviated from actual process measurements, indicating room for improvement in system accuracy and reliability. The findings suggest that while current control systems generally function well, there is potential for enhancing their performance through targeted interventions based on forecasting results. Manufacturing companies should prioritise regular maintenance and calibration of equipment to ensure consistent process output. Training programmes for operators are also recommended to improve system efficiency. The maintenance outcome was modelled as $Y_t = \beta_0 + \beta_1 X_t + u_t + v \epsilon_t$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Uganda, Geographic Information Systems, Time-Series Analysis, Forecasting Models, System Reliability, Control Theory, Quality Management*

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