



# Time-Series Forecasting Model Evaluation for System Reliability in Tanzanian Manufacturing Plants

Simba Mwakabaka<sup>1,2</sup>, Kamau Tshabalala<sup>3</sup>

<sup>1</sup> Tanzania Commission for Science and Technology (COSTECH)

<sup>2</sup> Department of Electrical Engineering, State University of Zanzibar (SUZA)

<sup>3</sup> State University of Zanzibar (SUZA)

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**Correspondence:** [smwakabaka@aol.com](mailto:smwakabaka@aol.com)

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## Author notes

*Simba Mwakabaka is affiliated with Tanzania Commission for Science and Technology (COSTECH) and focuses on Engineering research in Africa.*

*Kamau Tshabalala is affiliated with State University of Zanzibar (SUZA) and focuses on Engineering research in Africa.*

## Abstract

Manufacturing plants in Tanzania face challenges in maintaining system reliability due to fluctuating operational conditions. A comparative analysis of various time-series models was conducted using historical data from multiple Tanzanian plants. Robust statistical techniques were applied to assess the predictive accuracy and reliability of these models. The ARIMA model demonstrated superior forecasting capabilities, with an average prediction error within  $\pm 5\%$  for key system performance indicators (SPIs). The time-series forecasting model evaluated in this study significantly improved the reliability assessment of manufacturing systems in Tanzania. Manufacturers should integrate the recommended ARIMA-based forecast into their maintenance and operation plans to enhance overall plant efficiency. time-series analysis, system reliability, Tanzanian manufacturing, ARIMA model The maintenance outcome was modelled as  $Y \{ \} = \beta_0 + \beta_1 X \{ \} + u_i + v \text{arepsilon} \{ \}$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** Tanzania, Time-Series Analysis, System Reliability, Forecasting Models, ARIMA, Monte Carlo Simulation, Bayesian Methods

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