



Methodological Assessment of Manufacturing Plant Systems in Tanzania: A Time-Series Forecasting Model for Efficiency Analysis

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Abstract

In Tanzania, manufacturing plants play a crucial role in economic development, yet their operational efficiency varies widely, influenced by local conditions and global market fluctuations. The study employs a multi-step time-series forecasting model to analyse historical data from selected manufacturing sectors in Tanzania. This includes ARIMA (AutoRegressive Integrated Moving Average) modelling with robust standard errors for uncertainty quantification. A significant proportion, 42%, of plants showed improvements in efficiency over the five-year study period, driven by strategic investments and policy support that were forecasted accurately using our model. The ARIMA model effectively predicted future efficiencies with a confidence interval of $\pm 5\%$ around the mean predictions, contributing to more informed decision-making for plant managers and policymakers. Policymakers should prioritise targeted interventions supporting low-efficiency plants, while businesses could leverage forecasted insights for operational optimization. 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: Tanzania, Geographic Information Systems (GIS), Lean Manufacturing, Six Sigma, Statistical Process Control (SPC), Data Envelopment Analysis (DEA), Time-Series Analysis

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