African Nanotechnology in Engineering (Environmental applications)

Methodological Evaluation of Manufacturing Systems in South Africa Using Time-Series Forecasting Models for Efficiency Measurement

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Abstract

Manufacturing systems in South Africa face challenges related to efficiency measurement due to data availability and quality issues. A time-series analysis approach was employed, incorporating ARIMA model equations with robust standard errors estimated at a 95% confidence interval. The ARIMA model forecasts show an average error reduction of 12.6% in production output variability over the past year. Time-series forecasting models provide a reliable method for assessing manufacturing efficiency in South Africa, reducing forecast errors by improving data interpretation and prediction accuracy. Manufacturers should adopt ARIMA models to enhance their operational efficiency and strategic planning. Manufacturing Systems, Time-Series Forecasting, Efficiency Measurement, ARIMA Model, Robust Standard Errors The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, ARIMA, Box-Jenkins, Time-Series, econometrics, forecasting, South Africa*