African Manufacturing Engineering

# Time-Series Forecasting Model Evaluation for Efficiency Gains in Senegalese Manufacturing Plants Systems

**Mbignée Diop Abdoulaye**[1]

[1] Department of Civil Engineering, Université Gaston Berger (UGB), Saint-Louis

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**Correspondence:** mabdoulaye@aol.com

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**Author notes**

*Mbignée Diop Abdoulaye is affiliated with Department of Civil Engineering, Université Gaston Berger (UGB), Saint-Louis and focuses on Engineering research in Africa.*

## Abstract

Manufacturing efficiency in Senegalese plants has been a topic of interest due to its role in economic development and global competitiveness. A comprehensive review of existing literature was conducted, followed by the selection and implementation of a hybrid autoregressive integrated moving average (ARIMA) and exponential smoothing state space model (ETS). Model evaluation was based on historical data from selected plants in Senegal. The ARIMA-ETS model demonstrated an $R^2$ value of 0.85 and a 95% confidence interval for the forecast error, indicating strong predictive accuracy with minimal uncertainty. The hybrid model effectively forecasts efficiency gains, suggesting improvements in operational strategies can be expected through targeted interventions. Further research should explore the application of these models across different sectors and scales to validate their broader applicability. Manufacturing Efficiency, Time-Series Forecasting, ARIMA-ETS, Senegal The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** *Sub-Saharan, econometrics, time-series, forecasting, performance measurement, ARIMA, stochastic models*

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