Methodological Evaluation of Manufacturing Plant Systems in Senegal Using Time-Series Forecasting for Reliability Assessment

Amadou Diop[1]**, Mamoudou Guèye**[2]**, Ibrahima Niang**[3]**, Sabally Sow**[4]

[1] Department of Sustainable Systems, Cheikh Anta Diop University (UCAD), Dakar

[2] Department of Electrical Engineering, Institut Sénégalais de Recherches Agricoles (ISRA)

[3] Institut Sénégalais de Recherches Agricoles (ISRA)

[4] Council for the Development of Social Science Research in Africa (CODESRIA), Dakar

Author notes

Amadou Diop is affiliated with Department of Sustainable Systems, Cheikh Anta Diop University (UCAD), Dakar and focuses on Engineering research in Africa.

Mamoudou Guèye is affiliated with Department of Electrical Engineering, Institut Sénégalais de Recherches Agricoles (ISRA) and focuses on Engineering research in Africa.

Ibrahima Niang is affiliated with Institut Sénégalais de Recherches Agricoles (ISRA) and focuses on Engineering research in Africa.

Sabally Sow is affiliated with Council for the Development of Social Science Research in Africa (CODESRIA), Dakar and focuses on Engineering research in Africa.

Abstract

Manufacturing plants in Senegal are critical for the country's economic development but face challenges related to system reliability and maintenance. A time-series forecasting model was developed using historical data from Senegalese manufacturing plants. The model's accuracy was evaluated through cross-validation techniques to ensure robustness and applicability in real-world scenarios. The analysis revealed a significant trend of daily production fluctuations, with variations exceeding 15% at peak hours, indicating potential issues that require proactive intervention. Time-series forecasting provided valuable insights into the stability and predictability of manufacturing plant operations in Senegal, highlighting areas for improvement in system reliability and maintenance strategies. Implement preventive maintenance schedules based on forecasted demand to minimise downtime and improve overall production efficiency. Additionally, invest in training programmes for staff to enhance their skills in predictive analytics. 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, stochastic processes, Monte Carlo simulation, predictive maintenance, supply chain management, data analytics*

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

✉ REQUEST FULL PAPER

Email: info@parj.africa

Request your copy of the full paper today!

SUBMIT YOUR RESEARCH

Are you a researcher in Africa? We welcome your submissions!

Join our community of African scholars and share your groundbreaking work.

Submit at: app.parj.africa

Scan to visit app.parj.africa

Open Access Scholarship from PARJ

Empowering African Research | Advancing Global Knowledge