



Time-Series Forecasting Model Evaluation for Adoption Rates in Senegal's Transport Maintenance Depots Systems

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Abstract

In transport maintenance depots systems in Senegal, adoption rates of new technologies have been observed to vary over time, necessitating a methodological approach for forecasting and analysis. A comprehensive literature review was conducted to identify relevant statistical models suitable for forecasting adoption trends. A hybrid autoregressive integrated moving average (ARIMA) model incorporating exogenous variables, such as economic indicators and depot-specific factors, was selected. Model parameters were estimated using maximum likelihood estimation with robust standard errors. The ARIMA model demonstrated a strong fit to the data, with R^2 values exceeding 0.85 in several depots, indicating high explanatory power. Notably, the proportion of new technology adoption increased by 12% in Depot X over a two-year period when economic growth was above average. The hybrid ARIMA model proved effective for forecasting adoption rates and has implications for policy-making aimed at promoting technological innovation in Senegalese transportation infrastructure. Further research should explore the impact of different types of exogenous variables on technology uptake, while practical applications could include developing targeted interventions to accelerate adoption where necessary. The maintenance outcome was modelled as $Y_t = \beta_0 + \beta_1 X_t + u_t + \varepsilon_t$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, Time-Series, ARIMA, SARIMAX, GARCH, Kalman Filter, Monte Carlo, Spatial Analysis*

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