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Time-Series Forecasting Model for Risk Reduction in Manufacturing Plants of Rwanda: An Engineering Perspective

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Abstract

This study focuses on evaluating the risk reduction strategies in manufacturing plants of Rwanda by applying a time-series forecasting model. A time-series forecasting approach was employed using an ARIMA (AutoRegressive Integrated Moving Average) model for data analysis. Uncertainty was quantified through robust standard errors, providing a measure of confidence in the forecasted outcomes. The empirical results indicated that by reducing energy consumption by 10% and implementing preventive maintenance schedules every six months, operational risks could be reduced by approximately 20%, based on historical data. This study confirms the effectiveness of the ARIMA model in predicting risk reduction strategies for manufacturing environments. The findings suggest a tangible benefit in terms of operational efficiency and cost savings through improved predictive maintenance practices. Manufacturers in Rwanda are advised to implement preventive maintenance schedules regularly and monitor energy consumption as key factors influencing operational risks. Rwanda, Manufacturing Plants, Risk Reduction, Time-Series Forecasting, ARIMA Model The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Rwanda, Geographic Information Systems (GIS), predictive analytics, neural networks, Monte Carlo simulations, data mining, clustering algorithms*

ABSTRACT-ONLY PUBLICATION

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