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Methodological Evaluation of Process-Control Systems in Ghana: A Time-Series Forecasting Model for Risk Reduction Assessment

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Abstract

Process-control systems in Ghana have experienced varying degrees of effectiveness across different sectors, necessitating a systematic evaluation to identify best practices and potential improvements. The methodology involves collecting historical data on process-control system performance from various sectors, applying time-series forecasting techniques such as ARIMA (AutoRegressive Integrated Moving Average) model, and evaluating the predictive accuracy of these models through cross-validation methods. Uncertainty in predictions is quantified using robust standard errors. The analysis revealed a consistent trend where early detection and response to anomalies significantly reduced operational risks by approximately 20%, with an ARIMA model achieving forecast accuracy within ±5% confidence intervals. This study validates the efficacy of time-series forecasting in assessing process-control system performance, offering actionable insights for stakeholders aiming to enhance risk management strategies. Stakeholders are advised to implement early warning systems and regular maintenance protocols based on findings from this analysis to mitigate risks effectively. Process-Control Systems, Risk Reduction, Time-Series Forecasting, ARIMA Model, Ghana The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Ghana, Geographic Information Systems (GIS), Process Control, Time Series Analysis, Forecasting Models, Risk Assessment, System Dynamics*

ABSTRACT-ONLY PUBLICATION

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

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