African Structural Geology (Earth Science)

Methodological Evaluation of Industrial Machinery Fleet Systems in Senegal: A Quasi-Experimental Design for System Reliability Assessment

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Abstract

Industrial machinery fleets play a critical role in Senegal's economic development, particularly within construction and mining sectors. A mixed-method approach combining surveys with machine learning algorithms for predictive analytics was employed. The study analysed data from 150 industrial machinery units over two years. The analysis revealed that proper preventive maintenance practices significantly reduced operational downtime by approximately 20%, indicating the effectiveness of the evaluated system in enhancing fleet reliability. This research provides a robust framework for assessing and improving the reliability of industrial machinery fleets, contributing to more efficient resource allocation in Senegal's construction and mining sectors. Based on findings, it is recommended that industry stakeholders implement regular maintenance schedules and invest in predictive analytics tools to further enhance fleet performance and reduce operational costs. The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, reliability engineering, predictive maintenance, stochastic models, inventory theory, geographic information systems, asset management*

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