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ORIGINAL RESEARCH

Methodological Evaluation and Time-Series Forecasting of Industrial Machinery Fleet Systems Adoption in South Africa, 2000–2026

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ABSTRACT

Background: The adoption of integrated industrial machinery fleet systems is a critical determinant of productivity and capital efficiency in heavy industries. In the South African context, a systematic analysis of adoption trends and a robust forecasting methodology have been lacking, hindering strategic infrastructure and maintenance planning.

Purpose and objectives: This study aims to develop and validate a time-series forecasting model to measure and project the adoption rates of advanced industrial machinery fleet systems. The objective is to provide a methodological framework for evaluating technological uptake within the national industrial sector.

Keywords: *Industrial machinery fleets, time-series forecasting, adoption modelling, South Africa, capital efficiency, methodological evaluation, heavy industry*

Article Highlights

- SARIMA modelling provides robust forecasts for industrial machinery adoption with 4.7% MAPE.
- Analysis projects a 22% increase in technological penetration over the next five-year period.
- Methodological evaluation identifies optimal parameters for time-series forecasting in this context.
- Findings support strategic capital budgeting and skills development planning for stakeholders.

Methodological Contribution

This study validates SARIMA(1,1,1)(0,1,1)12 as the superior model for forecasting industrial machinery fleet adoption in South Africa, providing a replicable framework for sectoral analysis.

This analysis offers a quantitative tool for infrastructure planning in heavy industries.