



Methodological Evaluation of Manufacturing Plant Systems in South Africa Using Time-Series Forecasting Models for Reliability Assessment

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Abstract

Manufacturing systems in South Africa have experienced varying degrees of reliability across different industries. A systematic review and analysis of existing studies that utilised time-series forecasting models to assess the reliability of manufacturing systems. The study employed a mixed-method approach including quantitative data synthesis and expert interviews. The meta-analysis revealed significant variation in system reliability estimates, with some models predicting up to a 25% improvement over baseline values, indicating substantial room for enhancement through better model application and parameter tuning. This study underscores the importance of selecting appropriate time-series forecasting models for accurate reliability assessments. The findings suggest improvements could be made by refining model parameters and incorporating additional data sources. Manufacturing managers should consider adopting ensemble methods or hybrid models that combine different forecasting techniques to enhance accuracy, while stakeholders in agriculture sectors can benefit from implementing these methodologies to improve system performance and resilience. manufacturing reliability, time-series forecasting, South Africa, agricultural systems The empirical specification follows $Y = \beta_{0+\beta}^{-} p X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Sub-Saharan, African, Spatio-Temporal, Analysis, Modelling, Reliability, Evaluation*

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