African Cartography and Geovisualization (Earth Science Methodology)

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

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Abstract

Manufacturing systems in South Africa are critical for economic growth, but their reliability is subject to fluctuations. Time-series forecasting models were applied to historical data from multiple manufacturing plants in South Africa. Robust standard errors and confidence intervals were used for inference. A significant proportion (45%) of systems showed a decline in reliability over one year, influenced by both internal operational factors and external environmental conditions. The time-series forecasting models provided insights into the systemic issues affecting manufacturing reliability, which can inform policy adjustments to enhance sustainability. Implementing continuous improvement strategies and integrating environmental considerations into maintenance practices could mitigate system failures. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Manufacturing systems, reliability engineering, time-series analysis, South Africa, econometrics, forecasting models, geographic information systems*

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