African Power Engineering

Methodological Evaluation of Manufacturing Plant Systems in South Africa Using Quasi-Experimental Design to Measure System Reliability

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Abstract

Manufacturing plants in South Africa face challenges related to system reliability, which can impact productivity and economic performance. A quasi-experimental design was employed, incorporating statistical modelling with robust standard errors to account for potential confounding variables. The analysis revealed that the proportion of manufacturing plants achieving high system reliability varied significantly across different regions in South Africa (e.g., 52% in Gauteng compared to 38% in Mpumalanga). Quasi-experimental design proved effective for measuring system reliability, highlighting regional disparities and providing insights into potential interventions. Future research should focus on investigating the factors contributing to regional differences and exploring evidence-based strategies to improve system reliability. The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *African geography, manufacturing systems, quasi-experimental design, reliability assessment, econometrics, performance metrics, system dynamics*

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