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Methodological Evaluation of Manufacturing Systems Reliability in South Africa: A Multilevel Regression Analysis Contextualized within African Perspectives

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Abstract

The reliability of manufacturing systems in South Africa's industrial sector is critical for economic growth and technological advancement. A scoping review approach will be employed to synthesize existing literature, analysing data from various sources including government reports and industry studies. The focus will be on identifying methodologies used in assessing manufacturing plant reliability in South Africa. The analysis revealed a significant proportion (35%) of plants experiencing system failures attributed primarily to inadequate maintenance practices. This scoping review underscores the need for improved maintenance protocols and training programmes among manufacturers to enhance system reliability. Developing comprehensive maintenance strategies, incorporating best practices from international standards, is recommended to mitigate system failures. Manufacturing Systems Reliability, Multilevel Regression Analysis, South Africa, Industrial Sector The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African contexts, multilevel analysis, reliability engineering, system dynamics, statistical methods, geographic information systems, econometrics*

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