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A Randomised Field Trial for Reliability Diagnostics in Nigerian Manufacturing Systems

A Methodological Evaluation

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ABSTRACT

Background: Manufacturing systems in Nigeria face persistent reliability challenges, yet rigorous field-based diagnostic methodologies for these contexts are underdeveloped. Existing reliability models often rely on theoretical assumptions not validated in real-world industrial settings within the region.

Purpose and objectives: This study aimed to methodologically evaluate a randomised field trial (RFT) framework for conducting reliability diagnostics in active manufacturing plants. The objective was to assess the framework's feasibility, precision, and practical utility for identifying systemic failure modes.

Keywords: *Manufacturing systems reliability, Sub-Saharan Africa, Randomised field trial, Diagnostic methodology, Industrial engineering, Nigerian manufacturing, Reliability engineering*

Article Highlights

- RFT framework proved feasible for in-situ reliability diagnostics in active plants.
- Intervention group identified 40% more latent failure modes than control lines.
- Primary failure cause shifted from perceived operator error to mechanical wear.
- Structured field approach enhances validity for maintenance decision-making.

Methodological Insight

The study implemented a randomised field trial across twelve production lines in three plants, using a Weibull proportional hazards model with robust standard errors clustered at plant level.

This study demonstrates a practical field methodology for reliability diagnostics in industrial settings.