African Maintenance Engineering

Methodological Evaluation of Process-Control Systems in Senegal Using Difference-in-Differences for System Reliability Assessment

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Abstract

Process-control systems (PCSs) are critical in ensuring reliability and efficiency in manufacturing processes across various industries, including those operating in Sub-Saharan Africa like Senegal. A DiD model was employed to assess the impact of PCS implementation on reducing downtime and increasing productivity, focusing on industrial settings in Senegal. Data were collected through surveys and operational records over a two-year period. The DiD approach revealed a statistically significant reduction in average monthly downtime by 25% post-implementation compared to pre-intervention phases, with 95% confidence interval for the difference-in-differences estimate of -0.25 (standard error: ±0.06). The DiD model demonstrated its utility in quantifying system reliability improvements attributable to PCS implementation. Further studies should explore long-term effects and scalability of these findings across different industries and regions. Process-Control Systems, Difference-in-Differences, System Reliability, Senegal The maintenance outcome was modelled as $Y\{\}=beta0+beta1X\{\}+ui+varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, PCSs, reliability, econometrics, intervention analysis, difference-in-differences, stochastic models*

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