African Geomatic Engineering

Methodological Evaluation of Process-Control Systems in Senegal: A Randomized Field Trial on System Reliability

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Abstract

Process-control systems are crucial for ensuring reliability in engineering projects, particularly in resource-rich environments like Senegal where infrastructure development is ongoing. A randomized field trial was conducted across multiple sites in Senegal, with samples randomly assigned to control and experimental groups. Data collection included operational metrics such as uptime, downtime frequency, and maintenance requirements. The analysis revealed that a specific process-control system (PCS) demonstrated an 85% reduction in downtime compared to the standard practice, indicating improved reliability under field conditions. This study provides empirical evidence supporting the effectiveness of PCS in enhancing system reliability in Senegal's engineering context. Based on findings from this trial, it is recommended that all future projects in Senegal adopt or upgrade to these process-control systems for improved performance and sustainability. The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, randomized controlled trial, reliability theory, statistical process control, geographic information systems, experimental design, quality assurance*

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