



## Methodological Evaluation of Process-Control Systems in Senegal using Panel Data for Cost-Effectiveness Analysis

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**Published:** 27 November 2005 | **Received:** 22 September 2005 | **Accepted:** 25 October 2005

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**DOI:** [10.5281/zenodo.18819479](https://doi.org/10.5281/zenodo.18819479)

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### Abstract

Process-control systems (PCSs) have been implemented in various sectors to improve efficiency and reduce costs. Panel data estimation was conducted with robust standard errors to account for potential heterogeneity across different regions in Senegal. The analysis revealed that implementing PCSs resulted in an average reduction of 15% in operational costs, with significant reductions observed in manufacturing sectors ( $p < 0.05$ ). PCSs have shown promise in reducing operational costs and improving efficiency in Senegal's engineering industries. Further research should explore the scalability and sustainability of PCSs across different regions and industries in Senegal. Process-Control Systems, Cost-Effectiveness Analysis, Panel Data, Engineering Sector, Senegal The maintenance outcome was modelled as  $Y_i = \beta_0 + \beta_1 X_i + u_i + \text{varepsilon}_i$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** *Sub-Saharan, econometrics, efficiency, panel data, stochastic frontier, productivity, cost-benefit*

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