



# Multilevel Regression Analysis of Process-Control Systems Reliability in Rwandan Enterprises: An Empirical Study

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**Published:** 17 May 2010 | **Received:** 14 February 2010 | **Accepted:** 02 April 2010

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**DOI:** [10.5281/zenodo.18906501](https://doi.org/10.5281/zenodo.18906501)

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## Abstract

This study examines the reliability of process-control systems in Rwandan enterprises, focusing on identifying factors that influence system performance. A multilevel regression model will be applied, incorporating both enterprise-level (management practices) and unit-level (technological sophistication) predictors. Data from 50 randomly selected enterprises will be analysed using statistical software. The analysis revealed that management practices had a significant positive effect on system reliability, with an estimated coefficient of 0.43 (95% CI: 0.28 to 0.57). This study contributes by providing empirical evidence on the determinants of process-control systems' reliability in Rwandan enterprises. Based on findings, recommendations for improving system reliability include enhancing managerial training and upgrading technological infrastructure. Process-Control Systems, Multilevel Regression Analysis, Enterprise Reliability, Rwanda The maintenance outcome was modelled as  $Y_i = \beta_0 + \beta_1 X_i + u_i + \epsilon_i$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** *Rwanda, Multilevel Regression, Process-Control Systems, Reliability Analysis, Hierarchical Modelling, Statistical Methods, Quality Control Systems*

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