African Transport Economics (Economics/Engineering crossover)

Multilevel Regression Analysis of Process-Control Systems in South Africa: Methodological Evaluation for Risk Reduction

Thabo Modisaopha[1,2], **Siyavhuwa Motshegoa**[1]

[1] Wits Business School

[2] University of Zululand

Published: 14 May 2005 | **Received:** 04 February 2005 | **Accepted:** 12 April 2005

Correspondence: tmodisaopha@aol.com

DOI: 10.5281/zenodo.18820135

Author notes

Thabo Modisaopha is affiliated with Wits Business School and focuses on Engineering research in Africa.
Siyavhuwa Motshegoa is affiliated with Wits Business School and focuses on Engineering research in Africa.

Abstract

In recent years, South Africa has implemented process-control systems to mitigate risks in various sectors, including transport and engineering. However, the effectiveness of these systems varies significantly across different regions and contexts. This intervention study employs multilevel regression analysis, utilising data from multiple sources including industry reports, regulatory records, and field observations. The analysis aims to account for both individual-level (e.g., company performance) and contextual-level (e.g., regional infrastructure) factors affecting risk reduction. Our findings indicate that the level of investment in process-control systems significantly correlates with a 15% reduction in operational risks, as measured by the number of accidents per year. This suggests that adequate resource allocation is crucial for effective risk mitigation. The multilevel regression analysis provides robust evidence on the impact of process-control systems and highlights the importance of considering both organisational and environmental factors when implementing such interventions. Based on our findings, we recommend prioritising investments in process-control systems with a focus on areas where risks are highest. Additionally, policymakers should consider regional-specific strategies to enhance overall risk reduction effectiveness. South Africa, process-control systems, multilevel regression analysis, risk reduction The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *African geography, multilevel regression, process-control systems, risk assessment, nested data analysis, qualitative evaluation, statistical methods*

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

✉ REQUEST FULL PAPER

Email: info@parj.africa

Request your copy of the full paper today!

SUBMIT YOUR RESEARCH

Are you a researcher in Africa? We welcome your submissions!

Join our community of African scholars and share your groundbreaking work.

Submit at: app.parj.africa

Scan to visit app.parj.africa

Open Access Scholarship from PARJ

Empowering African Research | Advancing Global Knowledge