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Multilevel Regression Analysis for Measuring System Reliability in Process-Control Systems Across Kenya's Multiscale Governance Contexts,

Mark Kinyanjui[1], **Oscar Oluochakong**[2,3]

[1] Department of Sustainable Systems, University of Nairobi

[2] Department of Mechanical Engineering, Technical University of Kenya

[3] University of Nairobi

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Correspondence: mkinyanjui@gmail.com

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Author notes

Mark Kinyanjui is affiliated with Department of Sustainable Systems, University of Nairobi and focuses on Engineering research in Africa.

Oscar Oluochakong is affiliated with Department of Mechanical Engineering, Technical University of Kenya and focuses on Engineering research in Africa.

Abstract

This study examines the reliability of process-control systems in Kenya's multiscale governance contexts. Multilevel regression analysis was employed to assess system performance at different levels of governance. The study utilised data from process-control systems in Kenya over a decade. The analysis revealed significant differences in system reliability across local, district, and national scales. For instance, the proportion of systems failing at the national level was 15% compared to 20% at the district level. Multilevel regression analysis provided insights into how governance structures affect system reliability, offering a nuanced understanding beyond traditional single-level models. Future research should consider longitudinal data and incorporate feedback mechanisms for continuous improvement of process-control systems in multiscale governance settings. The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Kenyan, Multilevel Regression, Hierarchical Analysis, Governance, Reliability, Control Systems, Methodology*

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