



Bayesian Hierarchical Model for Evaluating Risk Reduction in Process-Control Systems in Rwanda: An Engineering Perspective

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Abstract

This paper focuses on evaluating risk reduction in process-control systems within industrial settings in Rwanda, a developing country with significant environmental challenges. A Bayesian hierarchical model will be used to analyse data collected from industrial processes across Rwanda, with a focus on identifying common risk factors and determining the impact of control measures. The analysis revealed that process-control systems in some sectors were effective in reducing operational risks by up to 30%, though variability existed between different industries. The Bayesian hierarchical model provided insights into the effectiveness of current control strategies, highlighting areas for improvement and suggesting new intervention points. Based on findings from this study, specific recommendations will be made for enhancing risk management in industrial processes to ensure greater operational safety and environmental sustainability. 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, Bayesian, Hierarchical, Model, Risk, Control, Engineering*

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