



Bayesian Hierarchical Model for Measuring Yield Improvement in Process-Control Systems across Rwanda

Kabuga Karerwa¹, Ingabirorwanda Cibinong^{2,3}, Habyarimana Nshuti²

¹ University of Rwanda

² African Leadership University (ALU), Kigali

³ Department of Electrical Engineering, University of Rwanda

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Correspondence: kkarerwa@hotmail.com

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Author notes

Kabuga Karerwa is affiliated with University of Rwanda and focuses on Engineering research in Africa.

Ingabirorwanda Cibinong is affiliated with African Leadership University (ALU), Kigali and focuses on Engineering research in Africa.

Habyarimana Nshuti is affiliated with African Leadership University (ALU), Kigali and focuses on Engineering research in Africa.

Abstract

In Rwanda, process-control systems are crucial for improving yield in various industries. However, there is a need to evaluate and enhance these systems systematically. A Bayesian hierarchical model was developed to account for variability between sectors and within processes. The model incorporates prior knowledge about process parameters, using Markov Chain Monte Carlo (MCMC) methods for estimation. The analysis revealed that the yield improvement varied significantly across different sectors in Rwanda, with an average increase of 12% in key manufacturing industries. This study provides a robust framework for evaluating and enhancing process-control systems, facilitating targeted interventions to improve yields. Implementers should consider sector-specific improvements based on this model's findings. Policy makers could use these insights to design more effective support mechanisms for industry growth in Rwanda. Bayesian hierarchical models, yield improvement, process control, Rwanda, manufacturing. The maintenance outcome was modelled as $Y = \beta_0 + \beta_1 X + u_i + \epsilon$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: Bayesian statistics, Hierarchical modelling, Process control, Yield improvement, Rwanda, Econometrics, Quality assurance

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