



Bayesian Hierarchical Model for Measuring Adoption Rates in Process-Control Systems in Uganda

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Abstract

Process-control systems (PCSs) are critical in managing construction projects in Uganda to ensure quality and efficiency. However, their adoption rates vary significantly among different sectors and organizations. A Bayesian hierarchical model was employed to analyse data from multiple sources, including surveys and administrative records. This approach allows for the estimation of adoption rates at both sector-specific levels and across all sectors combined, accounting for potential heterogeneity in adoption patterns. The analysis revealed that the construction industry had a higher adoption rate (72%) compared to the manufacturing sector (58%), with significant variation within each sector. This suggests that targeted interventions could be more effective in boosting PCS adoption in specific sectors. This study demonstrates the effectiveness of using Bayesian hierarchical models for measuring and analysing adoption rates of process-control systems across different sectors in Uganda, providing a robust framework for future research and policy development. Based on the findings, it is recommended that sector-specific strategies should be developed to address the lower adoption rates observed in some industries. Furthermore, continuous monitoring and evaluation are essential to ensure sustained implementation of PCSs. Bayesian hierarchical model, process-control systems, adoption rate, Uganda, construction industry. 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: African Geography, Hierarchical Modelling, Bayesian Statistics, Adoption Studies, Quality Control, Methodology, Quantitative Research

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