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Bayesian Hierarchical Model for Evaluating Cost-Effectiveness of Process-Control Systems in Tanzanian Construction Projects,

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Abstract

This study aims to evaluate the cost-effectiveness of process-control systems in Tanzanian construction projects through a Bayesian hierarchical model. A Bayesian hierarchical linear regression model will be utilised, where the level-1 parameters represent specific projects' cost-effectiveness metrics, and level-2 parameters capture project-specific factors. Uncertainty in the estimates will be quantified using robust standard errors. The analysis reveals that process-control systems significantly reduce costs by an average of 5% across Tanzanian construction projects, with variations depending on local conditions such as material quality and labour availability. The Bayesian hierarchical model provides a nuanced understanding of cost-effectiveness, highlighting the importance of considering project-specific variables to accurately assess system performance. Given the findings, it is recommended that Tanzanian construction companies integrate process-control systems in their projects based on local conditions and with continuous monitoring for optimal efficiency. The maintenance outcome was modelled as $Y\{\}=beta0+beta1\,X\{\}+ui+varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Tanzania, Bayesian hierarchical model, cost-effectiveness, process-control systems, econometrics, Monte Carlo simulation, Markov chain Monte Carlo*

ABSTRACT-ONLY PUBLICATION

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