

COMPARATIVE STUDY

A Comparative Methodological Evaluation of Process-Control Systems in Tanzania

A Bayesian Hierarchical Model for Adoption Rate Analysis

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ABSTRACT

Background: The adoption of modern process-control systems in industrial sectors is critical for enhancing efficiency and safety. In many developing economies, however, the measurement and analysis of adoption rates are hindered by heterogeneous data sources and contextual variability, leading to imprecise policy and investment decisions.

Purpose and objectives: This study presents a novel methodological framework for the comparative evaluation of process-control system adoption. Its primary objective is to develop and apply a Bayesian hierarchical model to analyse adoption rates, explicitly accounting for regional and sectoral heterogeneity within the Tanzanian context.

Keywords: *Bayesian hierarchical modelling, process-control systems, technology adoption, Sub-Saharan Africa, comparative methodology, industrial automation*

Article Highlights

- Bayesian model quantifies significant contextual variation in adoption rates across sectors and regions.
- Facilities with dedicated technical staff were 3.2 times more likely to adopt advanced systems.
- Methodology provides robust advancement over traditional analyses by explicitly modelling heterogeneity.
- Findings advocate for policy that pairs technology provision with human capital development.

Core Methodological Contribution

A Bayesian hierarchical logistic regression model explicitly accounts for sectoral and regional heterogeneity in adoption analysis, quantifying uncertainty through posterior distributions.

This study presents a novel analytical framework for technology adoption in industrial contexts.

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

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