



# Bayesian Hierarchical Model for Measuring Adoption Rates in Ethiopian Manufacturing Plants Systems

Zenebhi Gebreanutaa<sup>1</sup>, Birru Mengistu<sup>1,2</sup>, Gimbri Nega<sup>3</sup>, Fitwi Abayie<sup>1,3</sup>

<sup>1</sup> Gondar University

<sup>2</sup> Hawassa University

<sup>3</sup> Addis Ababa University

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**Correspondence:** [zgebreanutaa@yahoo.com](mailto:zgebreanutaa@yahoo.com)

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## Author notes

*Zenebhi Gebreanutaa is affiliated with Gondar University and focuses on Engineering research in Africa.*

*Birru Mengistu is affiliated with Hawassa University and focuses on Engineering research in Africa.*

*Gimbri Nega is affiliated with Addis Ababa University and focuses on Engineering research in Africa.*

*Fitwi Abayie is affiliated with Gondar University and focuses on Engineering research in Africa.*

## Abstract

This study focuses on evaluating the adoption rates of manufacturing systems in Ethiopian plants through a Bayesian hierarchical model. A Bayesian hierarchical model was employed to analyse the adoption rates of systems in Ethiopian manufacturing plants. The model incorporates uncertainty through robust standard errors and provides estimates of adoption proportions by sector and region. The analysis revealed significant variation in adoption rates across industrial clusters, with some regions showing higher adoption rates than others, indicating potential differences in system uptake based on local conditions. Bayesian hierarchical modelling offers a nuanced understanding of adoption dynamics in Ethiopian manufacturing, highlighting the importance of sector-specific and regional factors. Future research should consider integrating additional variables to refine the model and enhance its predictive capabilities. Policy makers could use these insights to tailor support programmes for underperforming regions. Bayesian hierarchical modelling, adoption rates, Ethiopian manufacturing, industrial clusters, robust standard errors. The maintenance outcome was modelled as  $Y_i = \beta_0 + \beta_1 X_i + u_i + \text{varepsilon}_i$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** Ethiopia, Hierarchical Bayesian Models, Adoption Rates, Manufacturing Systems, Spatial Analysis, Monte Carlo Methods, Random Effects Models

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