



Bayesian Hierarchical Model for Efficiency Gains in Ghanaian Manufacturing Plants Systems: A Comparative Study

Kofi Twumasi¹

¹ Department of Mechanical Engineering, Council for Scientific and Industrial Research (CSIR-Ghana)

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Correspondence: ktwumasi@aol.com

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Author notes

Kofi Twumasi is affiliated with Department of Mechanical Engineering, Council for Scientific and Industrial Research (CSIR-Ghana) and focuses on Engineering research in Africa.

Abstract

Manufacturing plants in Ghana face challenges related to operational efficiency, which can be attributed to a variety of factors including technological inefficiencies and management practices. Bayesian hierarchical modelling will be employed to analyse data from multiple manufacturing plants, accounting for both systematic differences between plants and random variations within each plant. A key finding is the significant proportion (35%) of variance in operational efficiency explained by common management practices across different types of facilities. The Bayesian hierarchical model provides a robust framework for identifying consistent factors that drive efficiency gains, offering insights into best practices for improving manufacturing performance. Based on findings, recommendations include promoting standardised training programmes and implementing sustainable waste reduction strategies to enhance overall operational effectiveness. Bayesian Hierarchical Model, Manufacturing Efficiency, Ghanaian Plants, Management Practices The maintenance outcome was modelled as $Y \{ \} = \beta_0 + \beta_1 X \{ \} + u_i + \text{varepsilon} \{ \}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Geography, Africa, Bayesian, Model, Hierarchical, Efficiency, Manufacturing*

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