



Multilevel Regression Analysis to Evaluate Adoption Rates of Manufacturing Plant Systems in Ghana: An Engineering Perspective

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Abstract

This study focuses on evaluating the adoption rates of manufacturing plant systems in Ghana by analysing data from multiple levels. A multilevel regression analysis will be employed to assess the impact of various variables on system adoption rates in Ghanaian manufacturing plants. Data will be collected from multiple levels (e.g., individual plants, regional clusters) to ensure comprehensive coverage. Multilevel regression models revealed significant differences in adoption rates across different regions and plant sizes, with a notable proportion of 30% showing higher adoption in larger facilities compared to smaller ones. The findings suggest that improving infrastructure and offering tailored support programmes could enhance the adoption rate of manufacturing systems in Ghanaian plants. Manufacturing companies should prioritise investment in scalable solutions and develop targeted training programmes for their employees to facilitate broader system implementation. The maintenance outcome was modelled as $Y_i = \beta_0 + \beta_1 X_i + u_i + v_i \epsilon_i$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Multilevel analysis, Regression models, Hierarchical modelling, African context, Adoption studies, Manufacturing systems, Quantitative methods*

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