African Safety Engineering

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

Yared Desta[1], **Dawit Abraha**[2]

[1] Department of Sustainable Systems, Gondar University

[2] Department of Sustainable Systems, Bahir Dar University

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Correspondence: ydesta@gmail.com

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Author notes

Yared Desta is affiliated with Department of Sustainable Systems, Gondar University and focuses on Engineering research in Africa.

Dawit Abraha is affiliated with Department of Sustainable Systems, Bahir Dar University and focuses on Engineering research in Africa.

Abstract

Manufacturing plants in Ethiopia have implemented various safety systems to enhance productivity and worker welfare. However, adoption rates of these systems vary significantly among different sectors and regions. A Bayesian hierarchical model was developed to account for variability across multiple factors such as plant size, sector type, and geographic location. Data from 50 randomly selected Ethiopian manufacturing plants were analysed. The adoption rate of safety systems in medium-sized plants (40-100 employees) in the textile sector was found to be 72% with a 95% credible interval of [68%, 76%]. The Bayesian hierarchical model provided nuanced insights into the factors influencing adoption rates, offering tailored recommendations for policy makers and industry practitioners. Implementing targeted interventions in underperforming sectors could significantly boost overall safety system adoption. Bayesian Hierarchical Model, Adoption Rates, Ethiopian Manufacturing Plants, Safety Systems The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Ethiopia, Hierarchical Modelling, Bayesian Statistics, Adoption Rate, Manufacturing Systems, Methodology, Quantitative Research*

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