



Methodological Evaluation of Manufacturing Plant Systems in Ethiopia Using Multilevel Regression Analysis for Risk Reduction Assessment

Muluken Wolde¹, Berhanu Beyene^{2,3}, Fekadu Assefa⁴, Tesfaye Amede⁵

¹ Department of Electrical Engineering, Bahir Dar University

² Department of Sustainable Systems, Addis Ababa University

³ Bahir Dar University

⁴ Haramaya University

⁵ Addis Ababa University

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Correspondence: mwolde@hotmail.com

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Author notes

Muluken Wolde is affiliated with Department of Electrical Engineering, Bahir Dar University and focuses on Engineering research in Africa.

Berhanu Beyene is affiliated with Department of Sustainable Systems, Addis Ababa University and focuses on Engineering research in Africa.

Fekadu Assefa is affiliated with Haramaya University and focuses on Engineering research in Africa.

Tesfaye Amede is affiliated with Addis Ababa University and focuses on Engineering research in Africa.

Abstract

Manufacturing plants in Ethiopia face significant operational challenges that increase production risks. Understanding these systems is crucial for improving efficiency and safety. The study employs multilevel regression analysis to assess the impact of various factors on production risks. Data were collected from SMEs across different regions and analysed using statistical software. Multilevel regression analysis revealed that management practices significantly influence risk reduction, with a positive effect observed in SMEs ($p < 0.05$). The findings suggest that adopting structured management strategies can substantially reduce production risks in Ethiopian manufacturing plants. Policy makers should promote the adoption of best management practices to enhance safety and efficiency in Ethiopia's manufacturing sector. The maintenance outcome was modelled as $Y_i = \beta_0 + \beta_1 X_i + u_i + \epsilon_i$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: Ethiopia, Multilevel Regression, Hierarchical Analysis, Supply Chain Management, Risk Assessment, Econometrics, Systems Engineering

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