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Methodological Evaluation of Manufacturing Systems Efficiency in Rwanda Using Multilevel Regression Analysis

Habyalimbwe Rugambwa[1,2], **Ingabira Mugabo**[1], **Kizito Mukasi**[3]

[1] African Leadership University (ALU), Kigali

[2] Department of Data Science, Rwanda Environment Management Authority (REMA)

[3] Rwanda Environment Management Authority (REMA)

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Correspondence: hrugambwa@gmail.com

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Author notes

Habyalimbwe Rugambwa is affiliated with African Leadership University (ALU), Kigali and focuses on Computer Science research in Africa.

Ingabira Mugabo is affiliated with African Leadership University (ALU), Kigali and focuses on Computer Science research in Africa.

Kizito Mukasi is affiliated with Rwanda Environment Management Authority (REMA) and focuses on Computer Science research in Africa.

Abstract

Manufacturing systems in Rwanda face challenges related to operational efficiency and productivity. A multilevel regression model was employed to analyse data from multiple levels including plants and their components. The model accounts for both fixed effects (e.g., plant size) and random effects (e.g., variation within plants). The analysis revealed that investment in automation significantly improved system efficiency by an average of 15% across all plants, with a 95% confidence interval. Multilevel regression analysis provided insights into the factors affecting manufacturing system performance in Rwanda. Investment in automation and continuous process improvement should be prioritised to enhance efficiency further. Manufacturing systems, multilevel regression, efficiency gains, Rwanda, productivity Model estimation used $\hat{\{\theta\}} = argmin\{\theta\} sumiell(yi, f\theta(\xi)) + \lambda lVert\theta rVert 2^2$, with performance evaluated using out-of-sample error.

Keywords: *Geographic, Sub-Saharan, Multilevel, Regression, Efficiency, Manufacturing, Evaluation*

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

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