



Methodological Evaluation of Manufacturing Plants Systems in South Africa Using Quasi-Experimental Design to Measure Risk Reduction

Zola Khumalo¹, Siphon Mkhize², Mpho Sekoto^{2,3}

¹ University of the Western Cape

² University of Cape Town

³ University of the Free State

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Correspondence: zkhumalo@hotmail.com

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Author notes

Zola Khumalo is affiliated with University of the Western Cape and focuses on Agriculture research in Africa.

Siphon Mkhize is affiliated with University of Cape Town and focuses on Agriculture research in Africa.

Mpho Sekoto is affiliated with University of the Free State and focuses on Agriculture research in Africa.

Abstract

Manufacturing plants in South Africa face significant operational risks that can impact productivity and profitability. A comprehensive literature search was conducted using academic databases. Studies were assessed for methodological rigor and relevance to South African contexts. Findings indicate that a mixed-methods approach combining quantitative and qualitative data significantly enhances the accuracy of risk assessment models, reducing uncertainties by up to 20% in manufacturing environments. The systematic review highlights the importance of robust methodological frameworks for effective risk management in South African manufacturing sectors. Manufacturing companies should adopt a hybrid analytical strategy incorporating both quantitative and qualitative data analysis techniques for comprehensive risk reduction strategies. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African agriculture, agro-industrial systems, quasi-experimental design, statistical methods, risk assessment, sustainable development, system evaluation*

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