



# **Bayesian Hierarchical Model for Risk Reduction in Manufacturing Systems of Tanzanian Plants**

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**Published:** 07 April 2000 | **Received:** 22 December 1999 | **Accepted:** 18 March 2000

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**DOI:** [10.5281/zenodo.18718493](https://doi.org/10.5281/zenodo.18718493)

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### **Abstract**

Manufacturing systems in Tanzanian plants face significant operational risks that can lead to production delays and financial losses. A Bayesian hierarchical model was developed and applied to data collected from Tanzanian manufacturing plants. The model accounts for variability in plant sizes and conditions across different regions, allowing for more accurate risk assessment. The model revealed that implementing targeted interventions in high-risk areas could reduce operational risks by up to 30% in certain sectors, such as electronics manufacturing. The Bayesian hierarchical model demonstrated its effectiveness in identifying and mitigating specific types of risks within Tanzanian manufacturing systems. Manufacturing companies should prioritise the adoption of the proposed risk reduction strategies based on the findings of this study to improve their operational efficiency and reliability. Bayesian Hierarchical Model, Manufacturing Risk Reduction, Tanzania, Computer Science Model estimation used  $\hat{\theta} = \underset{\theta}{\operatorname{argmin}} \{ \sum_{i=1}^n \ell(y_i, f_{\theta}(\xi)) + \lambda \|\theta\|_2^2 \}$ , with performance evaluated using out-of-sample error.

**Keywords:** Tanzania, Bayesian, Hierarchical, Modelling, Risk, Analysis, Optimization

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