

# Randomised Field Trial for Reliability Diagnostics in Rwandan Public Transport Maintenance Depots

Chantal Uwase<sup>1,2</sup>, Jean de Dieu Niyonzima<sup>3,4</sup>  
Marie Claire Uwimana<sup>2</sup>, Samuel Habimana<sup>1,4</sup>

University of Rwanda | African Leadership University (ALU), Kigali | Department of Sustainable Systems,  
University of Rwanda | Rwanda Environment Management Authority (REMA)

Correspondence: [cuwase@aol.com](mailto:cuwase@aol.com)

Received: 23 February 2016 | Accepted: 21 May 2016 | Published: 17 June 2016 | DOI:

[10.5281/zenodo.18972340](https://doi.org/10.5281/zenodo.18972340)

## ABSTRACT

Public transport maintenance depots in developing nations often operate with limited diagnostic resources, leading to unreliable vehicle fleets. Systematic, data-driven methods for assessing depot system reliability are lacking, particularly in sub-Saharan African contexts. This study aimed to develop and field-test a novel randomised diagnostic protocol to quantitatively evaluate the reliability of maintenance systems within public transport depots. The objective was to generate robust, comparative metrics for depot performance. A randomised field trial was conducted across multiple depots. The core intervention was a structured diagnostic audit applied to randomly selected vehicles and maintenance records. System reliability was modelled using a Weibull survival function,  $R(t) = \exp\{-(t/\eta)^\beta\}$ , where  $\eta$  is the scale parameter and  $\beta$  the shape parameter. Inference was based on 95% confidence intervals derived from bootstrapped samples. Depots implementing formal procedural checklists demonstrated a 34% higher median time to unscheduled corrective maintenance (95% CI: 22% to 48%). The principal failure mode identified was inconsistent parts inventory logging, which was strongly associated with increased system downtime. The randomised diagnostic protocol successfully generated quantifiable, comparative reliability metrics. Variability in depot performance is significantly linked to procedural standardisation, not merely resource levels. Maintenance depots should adopt standardised procedural checklists and integrated inventory tracking. Regulatory bodies should consider incorporating reliability diagnostics into routine depot licensing audits. reliability engineering, maintenance systems, randomised trial, transport infrastructure, diagnostic protocol, survival analysis This paper presents a novel randomised field methodology for depot-level reliability assessment, generating the first dataset of its kind for the region and providing a validated model for benchmarking maintenance system performance.

**Keywords:** *Randomised controlled trial, Reliability engineering, Maintenance diagnostics, Public transport, Sub-Saharan Africa, Data-driven maintenance, Fleet management*

### Article Highlights

- Novel randomised field trial methodology for depot-level reliability assessment.
- Procedural standardisation, not just resource levels, drives 34% higher maintenance intervals.
- Inconsistent parts inventory logging identified as principal failure mode for downtime.
- Provides first comparative dataset and benchmarking model for the region.

### Methodological Insight

System reliability was modelled using a Weibull survival function, with inference based on 95% confidence intervals from bootstrapped samples.

*This study establishes a quantifiable framework for auditing transport maintenance system reliability.*



## **ABSTRACT-ONLY PUBLICATION**

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

## **REQUEST FULL PAPER**

 **Email:** [info@parj.africa](mailto:info@parj.africa)

Request your copy of the full paper today!

## **SUBMIT YOUR RESEARCH**

**Are you a researcher in Africa? We  
welcome your submissions!**

Join our community of African scholars and share  
your groundbreaking work.

 **Submit at:** [app.parj.africa](http://app.parj.africa)



Scan to visit [app.parj.africa](http://app.parj.africa)

### **Open Access Scholarship from PARJ**

Empowering African Research | Advancing Global  
Knowledge