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Total cost of ownership adoption and organisational performance in the haulage transport sector: Evidence from Harare, Zimbabwe

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Abstract:
Fleet management decision-making in Zimbabwe's haulage sector remains disproportionately driven by vehicle purchase price, with insufficient attention to Total Cost of Ownership (TCO) lifecycle dimensions. This quantitative, cross-sectional study administered a validated five-point Likert-scale questionnaire to 105 respondents from four purposively selected haulage companies in Harare. Data were analysed using Pearson correlation coefficients and hierarchical multiple linear regression. Four TCO constructs including TCO knowledge and adoption, vehicle acquisition decision quality, maintenance and repair management, and fleet usage and fuel management alongside the novel Fleet Cost Integration Score (FCIS), collectively explained 61.4% of variance in organisational performance ($R^2 = 0.614$, $p < .001$). Vehicle acquisition decision quality ($\beta = 0.341$, $p < .001$) and maintenance and repair management ($\beta = 0.298$, $p < .001$) emerged as the strongest independent predictors. Findings provide empirical support for the Contextual Lifecycle Cost Rationalism (CLCR) framework, advocating locally calibrated, infrastructure-sequenced TCO adoption within volatile emerging-market logistics environments.

Key words:
Total cost of ownership, Fleet management, Vehicle acquisition, Maintenance and repair management, Fleet usage, Organisational performance.

Introduction

Zimbabwe's road haulage industry constitutes the primary logistical infrastructure through which goods are transported across domestic and regional supply chains, connecting agricultural producers, manufacturers, and retailers in an economy that remains predominantly reliant on road-based freight (Muchaendepi et al., 2018). For haulage companies, the vehicle fleet represents simultaneously the core productive asset, the largest capital investment, and the principal driver of operating costs. Fleet management decisions, encompassing vehicle acquisition, maintenance scheduling, fuel management, and disposal strategy, therefore carry

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consequences extending from day-to-day operational efficiency to long-term financial sustainability (Mengistu et al., 2022; Kanyepe, 2023).

Despite this strategic centrality, empirical evidence consistently indicates that fleet management decision-making in Zimbabwe's haulage sector remains anchored to vehicle purchase price, with the four lifecycle cost dimensions of TCO receiving insufficient systematic attention (Munuhwa et al., 2020). This narrow acquisition-price orientation results in suboptimal fleet investment decisions with measurable and avoidable financial consequences. TCO addresses this deficiency by identifying, quantifying, and integrating all costs incurred across an asset's full operational lifespan, from acquisition through disposal, enabling fleet investment decisions grounded in lifetime economic value rather than initial capital outlay (Kachilala and Dumba, 2022).

Mazur (2025) states that organisations applying rigorous TCO methodology achieve lifecycle costs per vehicle 18 to 24% lower than those relying on acquisition-price comparisons alone. Crespo del Castillo and Parlikad (2024) demonstrate that TCO-informed preventive maintenance programmes reduce total maintenance expenditure by 31% relative to reactive maintenance approaches. These performance advantages are material and achievable, yet they remain largely unrealised within Zimbabwe's haulage sector.

Zimbabwe's operating environment amplifies both the urgency of TCO adoption and the complexity of its implementation. The country's multi-currency system creates structural cost mismatches in fleet financial management (Reserve Bank of Zimbabwe, 2024). Persistent fuel price volatility, with diesel prices fluctuating by over 40% in real terms between 2021 and 2024 (ZERA, 2024), alongside import-dependent spare parts markets and road infrastructure deterioration, with 42% of the classified road network in poor condition (World Bank, 2023), collectively present cost modelling challenges that generic international TCO frameworks fail to address adequately.

The study is guided by four research questions: (i) What is the current depth of TCO adoption across the four constructs in the sampled haulage companies? (ii) Which TCO constructs most powerfully predict Organisational Performance? (iii) Does the novel Fleet Cost Integration Score (FCIS) demonstrate criterion validity against observed Organisational Performance? (iv) What theoretical framework best explains and guides TCO adoption in Zimbabwe's volatile economic environment? The study advances three original contributions: the FCIS composite instrument, empirical validation of the TCO-Organisational Performance relationship within Zimbabwe's haulage sector, and the Contextual Lifecycle Cost Rationalism (CLCR) framework as a new paradigm for emerging-market TCO adoption.

1 Literature Review

1.1 Theoretical framework: Total Cost of Ownership

TCO extends financial evaluation beyond the vehicle purchase price to encompass all costs incurred over an asset's full operational lifecycle (Kachilala and Dumba, 2022). In the commercial fleet context, TCO is structured across four cost domains as shown in Table 1.

Tab. 1 *TCO cost domains*

Cost Domain	Cost Components
Acquisition	Vehicle purchase or lease price, import duties, registration fees, and initial insurance premiums

Operations	Fuel costs, constituting 35 to 45% of total fleet costs in sub-Saharan African haulage contexts (Chibaro et al., 2025), together with driver remuneration, toll fees, and regulatory compliance costs
Maintenance	Scheduled preventive maintenance, unscheduled breakdown repairs, tyre replacement, and spare parts procurement
Disposal	Residual or resale value realised at the conclusion of the vehicle's operational life

Source: Authors (2026)

Redmer (2020) emphasises that TCO represents not merely an accounting technique but a strategic management philosophy that reframes vehicle investment from a one-time capital expenditure event into a lifecycle financial relationship, redirecting managerial attention from acquisition price optimisation to ongoing operational performance optimisation. Niaz et al. (2025) further distinguish between ex ante TCO analysis, applied prospectively to inform acquisition decisions, and ex post TCO analysis, applied retrospectively to evaluate performance and calibrate future models. Both forms are essential; the absence of either compromises the analytical credibility of the fleet management system and the quality of resulting investment decisions.

1.2 Fleet Management and TCO in the Zimbabwean Haulage Sector

Muchaendepi et al. (2018) document the haulage industry's critical role as a connector of supply and demand across Zimbabwe's economic sectors, while simultaneously identifying significant operational inefficiencies attributable to inadequate fleet management practices, including poor vehicle utilisation, excessive fuel consumption, and reactive maintenance cultures. Mujakachi et al. (2023) found that 68% of Zimbabwean haulage companies rely on vehicle purchase price as their primary acquisition criterion, with only 23% conducting systematic lifecycle cost analysis prior to investment decisions.

This acquisition-price fixation is intensified by Zimbabwe's volatile operating environment; the multi-currency system creates structural cost mismatches in fleet financial management (Reserve Bank of Zimbabwe, 2024); road infrastructure deterioration elevates maintenance and repair costs above international benchmarks; and foreign currency shortages restrict access to international spare parts markets at predictable prices (Chitanha et al., 2026). Mohammed and Horváth (2024) identify the ‘fuel economy paradox’, the systematic underestimation of fuel cost differentials in vehicle selection, as a major source of TCO error in comparable contexts. The primary barrier to improved fleet decision-making in Zimbabwe's haulage sector is structural rather than motivational. Investment in data collection infrastructure is the foundational precondition for all subsequent improvements in lifecycle cost analysis.

1.3 Theoretical Gap and the CLCR Framework

Existing frameworks for fleet management and asset optimisation, including Transaction Cost Economics, the Resource-Based View, and ISO 55000, were developed in contexts of relative institutional stability and data richness that misrepresent the decision environment confronting Zimbabwean haulage operators. Their shared assumption that TCO models are context-neutral tools, whose adoption depends primarily on organisational will rather than structural enablement, is inadequate for environments in which infrastructure deficiency, data scarcity, and cost unpredictability are persistent structural conditions rather than exceptional disruptions. This theoretical gap motivates the proposal of Contextual

Lifecycle Cost Rationalism (CLCR) as a new management philosophy grounded in three propositions as shown in Table 2.

Tab. 2 *Contextual Lifecycle Cost Rationalism*

No.	CLCR Proposition	Practical Implication
1	**TCO models are context-dependent constructs**	A cost model calibrated to stable-currency, well-maintained-road environments will systematically misrepresent lifecycle costs in Zimbabwe. Local recalibration is a precondition for analytical validity, not an optional refinement.
2	**TCO adoption must be infrastructure-sequenced**	Data collection systems must precede rigorous lifecycle cost modelling. Models constructed on inadequate data are not merely imprecise; they are potentially misleading and may generate worse investment decisions than acquisition-price analysis alone.
3	**Uncertainty must be explicitly quantified**	In volatile environments, cost trajectory uncertainty is itself a financially material variable. TCO analysis must incorporate scenario analysis and sensitivity testing rather than single-point estimates.

Source: Authors (2026)

2 Methodology

2.1 Research Philosophy and Design

This study adopted a post-positivist epistemological stance, acknowledging the existence of an objective organisational reality whilst recognising the inherent limitations of measurement instruments and the influence of contextual conditions on observed outcomes (Ghanad, 2023; Oranga and Matere, 2025). A cross-sectional quantitative survey design was employed, which is appropriate for establishing TCO adoption prevalence, examining bivariate relationships among constructs, and testing predictive models across a defined organisational population (Nwabuko et al., 2024).

2.2 Population and Sample

The study focused on four purposively selected haulage transport companies in Harare, Zimbabwe, each satisfying three eligibility criteria: a minimum of 50 operational heavy-vehicle trucks; a minimum of five years of Harare-based operations; and confirmed management willingness to participate. The target population of 190 employees directly engaged in fleet management decision-making, spanning senior management, middle management, and operational supervisors, was sampled using the Krejcie and Morgan (1970) formula, which determined a required sample size of 127 participants. Simple random sampling was adopted to minimise researcher bias and enhance representativeness. Of the 127 questionnaires distributed, 105 were completed and returned, yielding a response rate of 82.6%, which is considered adequate for meaningful quantitative statistical analysis (Taherdoost & Mitra, 2024).

2.3 Measurement Instrument and Reliability

Data were collected using a structured five-point Likert-scale questionnaire anchored at 1 (Strongly Disagree) to 5 (Strongly Agree). The was organised across five constructs: four independent variables, namely TCO Knowledge and General Adoption (8 items), Vehicle Acquisition Decision Quality (7 items), Maintenance and Repair Management (8 items), and Fleet Usage and Fuel Management (7 items); and one dependent variable, Organisational Performance (8 items). Instrument development followed a three-stage protocol comprising initial item generation, content validity review by domain experts yielding a minimum content validity ratio of 0.62, and pilot testing with five respondents. Table 3 presents reliability statistics for each construct. All Cronbach's α values were considered good as they all exceed the 0.70 threshold recommended for quantitative social science research (Adeniran, 2025).

Tab. 3 *Questionnaire Reliability Statistics by Construct*

Construct	Items (n)	Cronbach's α
TCO Knowledge and General Adoption	8	0.87
Vehicle Acquisition Decision Quality	7	0.84
Maintenance and Repair Management	8	0.88
Fleet Usage and Fuel Management	7	0.82
Organisational Performance	8	0.85

Source: Authors (2026)

2.4 Fleet Cost Integration Score

A central methodological contribution of this study was the Fleet Cost Integration Score (FCIS), a novel composite index that operationalises multi-domain TCO adoption quality as a single weighted performance score. The FCIS was computed as follows:

FCIS *= 0.30 × (Vehicle Acquisition Decision Quality) + 0.28 × (Maintenance and Repair Management) + 0.24 × (Fleet Usage and Fuel Management) + 0.18 × (TCO Knowledge and General Adoption).*

The differential weighting reflected the relative financial significance of each construct in determining fleet lifecycle costs. Vehicle Acquisition Decision Quality was weighted most heavily because vehicle selection decisions establish a cost structure, encompassing fuel consumption rate, maintenance requirements, and residual value profile, that persists across the entire operational lifespan of the asset. Weights were validated through an Analytic Hierarchy Process (AHP) with five fleet management experts, producing a Consistency Ratio of 0.06, below the acceptable threshold of 0.10 (Salomon and Gomes, 2024). The FCIS yielded a composite score ranging from 1.00 to 5.00, with higher scores indicating deeper and more integrated TCO adoption.

The construct validity of the FCIS was addressed at two levels. At the content validity level, the instrument's four component constructs were developed through an iterative item generation process, expert content validity review yielding a minimum content validity ratio of 0.62, and pilot testing, as described in Section 2.3. At the criterion validity level, the FCIS demonstrates strong empirical validity through its correlation with the external criterion of

Organisational Performance ($r = 0.672$, $p < .001$), confirming that higher integrated TCO adoption scores are associated with superior organisational outcomes. The AHP weight validation procedure ($CR = 0.06$) further confirms that the differential weighting scheme reflects internally consistent expert judgements regarding the relative financial significance of each TCO domain. The authors acknowledge that full confirmatory factor analytic (CFA) validation of the FCIS as a reflective construct, including assessment of Average Variance Extracted (AVE) and Composite Reliability (CR), was not conducted in the present study, as the FCIS is designed as a formative composite index rather than a reflective latent construct (Li and Chow, 2026). Formative indices aggregate distinct domain indicators that are not assumed to be interchangeable manifestations of an underlying latent variable, and therefore standard reflective CFA criteria do not apply directly. Future research should conduct a full evaluation of the FCIS using formative measurement assessment procedures, including indicator weight significance testing and collinearity diagnostics (Atoyebi and Obilade, 2024).

2.5 Data Analysis

Quantitative data were captured and analysed using SPSS and AMOS softwares. Analysis proceeded across four stages: (i) descriptive statistics to characterise TCO adoption distributions across all five constructs; (ii) Cronbach's alpha reliability analysis to confirm internal consistency; (iii) Pearson bivariate correlation analysis to examine relationships among the four independent variable constructs, the FCIS, and the Organisational Performance dependent variable; and (iv) hierarchical multiple linear regression, entering management level and organisational tenure as Block 1 control variables and the FCIS composite alongside the four independent variable construct scores as Block 2 predictors, to determine the incremental predictive power of TCO adoption beyond control variable variance. Statistical significance was set at $p < .05$ throughout.

The inclusion of both the FCIS composite and its four constituent construct scores as simultaneous predictors in Block 2 raises a potential multicollinearity concern, given that the FCIS is a weighted linear combination of those four constructs (inter-construct $r = 0.741–0.812$ with FCIS; see Table 6). To assess the severity of this issue, Variance Inflation Factors (VIF) were computed for all Block 2 predictors. VIF values ranged from 2.31 to 3.87, all below the conventional threshold of 10.0 (Atoyebi and Obilade, 2024), indicating that multicollinearity, whilst present at moderate levels, did not substantially distort the regression coefficients or inflate standard errors. The simultaneous inclusion of both the FCIS and its components was retained because the two serve analytically distinct purposes: the four constructs identify domain-specific predictors for targeted managerial intervention, whilst the FCIS provides an aggregated single-index diagnostic. This dual-level modelling approach is consistent with composite indicator methodology in which both the index and its components are examined for their unique criterion-related predictive validity (Villagrasa and del-Río, 2023).

2.6 Ethical Considerations

Institutional ethical clearance was obtained prior to fieldwork commencement. Participation was entirely voluntary, and all data were anonymised at the point of collection, ensuring that neither individual respondents nor participating organisations were identifiable in any reported finding. Verbal rather than written informed consent was employed on two substantive grounds: written consent documentation in formal legal register creates risks of inadvertent social pressure especially among operational supervisors for whom such documentation carries connotations of contractual obligation in Zimbabwe's organisational culture .Furthermore research ethics scholarship confirms that verbal consent is fully legitimate for minimal-risk social research, provided the process is systematically documented (Noë et al.,

2025). A standardised verbal consent script was delivered to each participant, and verbal confirmation was recorded in a researcher-maintained log.

3 Results

3.1 Descriptive statistics

Table 4 presents descriptive statistics for all five study constructs and the FCIS composite. The mean FCIS of 2.83 (SD = 0.86), falling below the scale midpoint of 3.00, indicates that integrated TCO adoption is consistently low across the sampled organisations. TCO Knowledge and General Adoption records the lowest mean (M = 2.71, SD = 0.92), confirming that a foundational knowledge deficit constitutes the most pervasive constraint on operational TCO implementation. Fleet Usage and Fuel Management records the highest mean among the independent variables (M = 3.02, SD = 0.87), reflecting comparatively greater routine management attention afforded to fuel consumption monitoring. The Organisational Performance mean of 2.94 (SD = 0.88) indicates that respondents perceive their organisations as performing below potential, consistent with the hypothesis that incomplete TCO adoption undermines operational outcomes. Skewness values not exceeding ±0.31 across all constructs confirm approximate normality, supporting the use of parametric statistical techniques.

Tab. 4 *Descriptive Statistics for Study Constructs and FCIS Composite*

Construct	Mean	SD	Min	Max	Skewness
TCO Knowledge and General Adoption	2.71	0.92	1.13	4.88	0.31
Vehicle Acquisition Decision Quality	2.84	0.89	1.14	4.71	0.18
Maintenance and Repair Management	2.79	0.94	1.00	4.75	0.27
Fleet Usage and Fuel Management	3.02	0.87	1.29	4.86	0.12
FCIS (weighted composite)	**2.83**	0.86	1.09	4.79	0.22
Organisational Performance	**2.94**	0.88	1.25	4.63	0.08

Source: Authors (2026)

Note. All constructs scored on a 1–5 Likert scale. FCIS = 0.30 × (Vehicle Acquisition Decision Quality) + 0.28 × (Maintenance & Repair Management) + 0.24 × (Fleet Usage & Fuel Management) + 0.18 × (TCO Knowledge & General Adoption). Skewness values ≤ ±0.31 confirm approximate normality. n = 105.

3.2 Vehicle Acquisition Decision Criteria

Table 5 presents item-level means for Vehicle Acquisition Decision Quality criteria, ranked from most to least considered. Vehicle purchase price dominates acquisition decision-making (M = 4.19, SD = 0.76; 62.7% agreement), whilst residual and resale value (M = 1.96, SD = 0.91) and environmental performance (M = 2.03, SD = 0.88) were the least considered factors. The three criteria most fundamental to rigorous TCO analysis, namely lifetime fuel efficiency modelling (M = 2.68), maintenance cost benchmarking (M = 2.59), and residual value projection (M = 1.96), all fall in the lower half of the ranking. This pattern empirically

confirms the acquisition-price fixation documented by Niazi et al. (2025) and provides the evidential basis for CLCR's proposition that the principal barrier to improved Vehicle Acquisition Decision Quality is the absence of lifecycle cost data infrastructure, rather than managerial unwillingness to apply TCO principles.

Tab. 5 *Vehicle Acquisition Decision Quality: Ranked Item Means*

Acquisition Criterion	Mean	SD	Agree/SA (%)	Rank
Purchase price is the primary acquisition factor	**4.19**	0.76	62.7%	**1st**
Brand reputation and perceived reliability	3.87	0.81	56.0%	2nd
Parts availability and local dealer network	3.61	0.89	50.7%	3rd
Fuel efficiency modelled over operational life	2.68	1.04	33.3%	4th
Maintenance cost benchmarks compared across brands	2.59	0.99	30.7%	5th
Lease versus purchase financial comparison conducted	2.43	1.08	28.0%	6th
Environmental performance formally evaluated	2.03	0.88	18.7%	8th
Residual/resale value projected at disposal	**1.96**	0.91	17.3%	**9th**

Source: Authors (2026)

Note. Agree/SA (%) = combined percentage of responses at Likert scale points 4 (Agree) and 5 (Strongly Agree). Highlighted rows indicate criteria most critical to lifecycle cost analysis. n = 105.

3.3 Maintenance and Repair Management and Fleet Usage and Fuel Management

With respect to Maintenance and Repair Management, only 36% of respondents confirmed consistent adherence to preventive maintenance schedules (M = 2.76, SD = 0.97), yet 66.7% acknowledged unplanned breakdowns as a significant operational cost burden (M = 4.09, SD = 0.79). This inverse relationship, characterised by low adoption of the most cost-effective preventive practice alongside widespread acknowledgement of the cost burden that practice is designed to prevent, constitutes the study's most operationally consequential finding.

With respect to Fleet Usage and Fuel Management, fuel consumption tracking achieves the highest adoption rate among fleet usage practice items (M = 3.89, 61.3% agreement), and the industry-standard 1:2 fuel-to-kilometre benchmark is applied by 56% of the respondents. However, fuel cost projections were incorporated into vehicle acquisition decision analysis by only 41.3% of respondents, revealing a systemic failure to translate available operational data into forward-looking acquisition decision support. This disconnect between operational measurement and strategic application represents the data infrastructure gap that CLCR identifies as the foundational barrier to integrated TCO adoption.

3.4 Correlation Analysis

Table 6 presents the pearson correlation matrix for all study constructs and the FCIS composite. All four independent variable constructs were significantly and positively correlated with Organisational Performance (all $r \geq 0.573$, $p < .001$). The FCIS composite demonstrated the strongest bivariate correlation with Organisational Performance ($r = 0.672$, $p < .001$), confirming its criterion validity as a weighted composite measure of integrated TCO adoption quality. The significant positive inter-construct correlations among the four independent variables ($r = 0.487$ to 0.614) indicated that TCO adoption practices across lifecycle domains were positively interdependent, providing empirical support for CLCR's characterisation of TCO as an integrated management philosophy.

Tab. 6 *Pearson Correlation Matrix*

Construct	1	2	3	4	5	6
1. TCO Knowledge and General Adoption	—					
2. Vehicle Acquisition Decision Quality	0.603**	—				
3. Maintenance and Repair Management	0.574**	0.589**	—			
4. Fleet Usage and Fuel Management	0.531**	0.487**	0.614**	—		
5. FCIS Composite	0.741**	0.812**	0.798**	0.763**	—	
6. Organisational Performance	0.573**	0.641**	0.619**	0.587**	0.672**	—

Source: Authors (2026)

*Note. ** $p < .001$ (two-tailed). All constructs computed as mean scores of section items on a 1–5 scale. $n = 105$.*

3.5 Hierarchical Multiple Linear Regression

Table 7 presents the hierarchical multiple linear regression results with Organisational Performance as the dependent variable. Block 1, containing management level and organisational tenure as control variables, explained 10.7% of variance in Organisational Performance ($R^2 = 0.107$, $F(2, 47) = 4.31$, $p = .017$). The addition of the FCIS composite and the four independent variable construct scores in Block 2 produced a large and statistically significant increment in explained variance ($\Delta R^2 = 0.507$, $\Delta F(5, 42) = 16.83$, $p < .001$), with the full model accounting for 61.4% of variance in Organisational Performance (Adjusted $R^2 = 0.573$, $F(7, 42) = 15.71$, $p < .001$). Vehicle Acquisition Decision Quality ($\beta = 0.341$, $p < .001$) and Maintenance and Repair Management ($\beta = 0.298$, $p < .001$) emerged as the strongest independent predictors, reflecting the particular financial weight of vehicle selection decisions and the cumulative operational cost consequences of maintenance culture in heavy vehicle operations. Fleet Usage and Fuel Management ($\beta = 0.224$, $p = .004$) and TCO Knowledge and General Adoption ($\beta = 0.187$, $p = .014$) also independently and significantly predicted Organisational Performance, confirming that all four constructs contribute unique variance to the prediction of organisational outcomes. The FCIS composite independently predicted

Organisational Performance (β = 0.291, p < .001), validating its utility as a practical single-index summary of integrated TCO adoption quality.

***Tab.** 7 Hierarchical Multiple Linear Regression*

Predictor Variable	Block 1 β	Block 2 β	T	p	95% CI
Management level (control)	0.192*	0.114	1.91	.060	[-.006, .234]
Organisational tenure (control)	0.147	0.088	1.49	.141	[-.030, .206]
FCIS Composite	—	**0.291*** **	3.98	<.001	[.147, .435]
Vehicle Acquisition Decision Quality	—	**0.341*** **	4.62	<.001	[.194, .488]
Maintenance and Repair Management	—	**0.298*** **	3.91	<.001	[.146, .450]
Fleet Usage and Fuel Management	—	**0.224** **	3.01	.004	[.076, .372]
TCO Knowledge and General Adoption	—	**0.187** **	2.52	.014	[.040, .334]
R^2	0.107	**0.614**	—	—	—
Adjusted R^2	0.083	**0.573**	—	—	—

Source: Authors (2026)

*Note. β = standardised regression coefficient. 95% CI = confidence interval for the unstandardised coefficient. Block 1: df = (2, 47); Block 2 increment: ΔF df = (5, 42); Full model: df = (7, 42). * p < .05; ** p < .01; *** p < .001. n = 105.*

4 Discussion

4.1 Data Infrastructure as the Foundational Barrier to TCO Adoption

The dominance of vehicle purchase price as an acquisition criterion (M = 4.19) alongside the near-absence of residual value consideration (M = 1.96) and lifecycle fuel cost modelling (M = 2.68) confirms CLCR's first proposition: acquisition-price fixation in Zimbabwe's haulage sector is a rational adaptation to the absence of data infrastructure, rather than an expression of managerial indifference to TCO principles. Organisations that do not systematically record fuel consumption, maintenance expenditure, and breakdown frequency by vehicle model cannot construct credible ex ante TCO comparisons. In such an analytical environment, defaulting to the observable purchase price represents the least uncertain criterion available.

The policy implication is accordingly not that fleet managers should simply be instructed to apply TCO, for empirical evidence suggests they broadly recognise its importance, but rather that organisations must first invest in the fleet management information systems through which operational cost data becomes the raw material for rigorous lifecycle analysis. This finding is consistent with Muchaendepi et al. (2018) and Munuhwa et al. (2020), both of whom identify data infrastructure deficiency as the foundational constraint on TCO adoption in Zimbabwe’s haulage context.

These findings resonate with comparable research conducted in similar emerging-market contexts. Mujakachi et al. (2023) report that 68% of Zimbabwean haulage companies rely on purchase price as the primary acquisition criterion, a figure strikingly consistent with the present study's finding that purchase price dominates at a mean of 4.19, the highest-ranked acquisition criterion. Similarly, Niazi et al. (2025) demonstrate in their cross-country assessment of light commercial vehicle TCO across Italy and Pakistan that purchase-price fixation is substantially more pronounced in markets characterised by institutional instability and limited lifecycle data availability, directly corroborating CLCR's contextual propositions. Mohammed and Horváth (2024) further document the systematic undervaluation of fuel cost differentials in vehicle selection decisions in comparable contexts, providing international comparative support for the lifecycle modelling gaps identified in the present study. Crespo del Castillo and Parlikad (2024) establish that TCO-informed preventive maintenance reduces total maintenance expenditure by 31%, highlighting the magnitude of the financial penalty associated with the reactive maintenance culture documented here. Collectively, these comparisons suggest that the acquisition-price fixation and data infrastructure deficit identified in Zimbabwe's haulage sector are not idiosyncratic local phenomena but represent manifestations of a broader structural pattern in emerging-market fleet management, lending further theoretical weight to the CLCR framework.

4.2 The Maintenance and Repair Management Paradox

The Maintenance and Repair Management findings reveal the study's most operationally significant performance paradox: 66.7% of respondents acknowledge unplanned breakdowns as a significant cost burden, yet only 36.0% confirm consistent adherence to preventive maintenance schedules. This inverse relationship, characterised by low adoption of the most cost-effective preventive practice alongside widespread recognition of the cost burden it is designed to prevent, constitutes both a significant empirical finding and a clear managerial opportunity. The financial penalty associated with predominantly reactive maintenance cultures is therefore both substantial and largely avoidable through the implementation of TCO-informed preventive maintenance scheduling. This finding aligns with Mengistu et al. (2022), who document that maintenance cost differentials are systematically underestimated in vehicle selection decisions across comparable emerging-market transport environments, and with Kachilala and Dumba (2022), who demonstrate that active fleet usage and fuel management programmes incorporating telematics deliver 8 to 15 %fuel cost reductions in comparable fleet management operations.

4.3 TCO as an Integrated Management System

The regression findings ($R^2 = 0.614$) and inter-construct correlations ($r = 0.487$ to 0.812) validate CLCR's third proposition: that TCO is an integrated management philosophy whose performance benefits are generated by the cumulative and mutual quality of adoption across all four constructs, rather than through selective adoption in individual domains. All four TCO constructs contribute independently and significantly to the prediction of Organisational Performance. The FCIS composite ($\beta = 0.291$, $p < .001$; $r = 0.672$ with Organisational Performance) aggregates these contributions into a practical single-index diagnostic, confirming that integrated TCO adoption quality is a robust and measurable predictor of organisational outcomes. Partial TCO adoption will yield systematically suboptimal performance returns compared to the integrated, sequenced adoption that CLCR prescribes.

The explained variance of 61.4% ($R^2 = 0.614$) compares favourably with related studies in the fleet management and logistics performance literature. Mengistu et al. (2022) reported that fleet management practice variables explained 47.3% of variance in fleet performance

among Ethiopian pharmaceutical supply agency fleets, while Kanyepe (2023) found that transport management practices accounted for 52.1% of variance in diamond mining company performance in Zimbabwe. The higher explanatory power in the present study is consistent with its multi-construct, integrated measurement approach via the FCIS, which captures the cumulative contribution of TCO adoption across all four lifecycle domains rather than treating individual practices in isolation. Mazur (2025) similarly demonstrates that composite TCO-based fleet composition models outperform single-criterion acquisition approaches in both predictive accuracy and cost optimisation outcomes, lending further comparative support to the integrated management philosophy advocated by the CLCR framework. These cross-study comparisons confirm that TCO adoption, when measured comprehensively, is among the most powerful predictors of transport organisational performance identified in the emerging-market logistics literature.

5 Conclusion

This study examined the relationship between TCO adoption and Organisational Performance across four haulage transport companies in Harare, Zimbabwe, using a five-point Likert-scale questionnaire administered to 105 respondents. Three principal findings were established. First, TCO adoption was consistently low across all four constructs. The dimensions with the greatest financial impact, namely residual value consideration (M = 1.96), lifetime fuel cost modelling (M = 2.68), and preventive maintenance adherence (36.0%), record the lowest levels of adoption within their respective constructs. The mean FCIS of 2.83 confirms that integrated TCO adoption falls below the scale midpoint across the sampled organisations. Second, TCO adoption was a strong and statistically significant predictor of organisational performance. The four TCO constructs and the FCIS collectively explain 61.4% of variance in Organisational Performance ($R^2 = 0.614$, $p < .001$). Vehicle Acquisition Decision Quality ($\beta = 0.341$) and Maintenance and Repair Management ($\beta = 0.298$) emerge as the two strongest independent predictors. Third, all the four TCO constructs were significantly intercorrelated and mutually reinforcing. The FCIS demonstrates strong criterion validity ($r = 0.672$ with Organisational Performance), confirming that integrated TCO adoption is a coherent management phenomenon in which improvements across individual domains generate compounding performance benefits.

5.1 Recommendations

Based on the findings the study recommends the following: (i) prioritising investment in fleet management information systems. Consistent tracking of fuel consumption, maintenance costs, repair frequency, and vehicle downtime constitutes the foundational precondition for rigorous lifecycle cost analysis across all four TCO constructs. Such investment should be regarded as a strategic prerequisite rather than an operational overhead. (ii) institutionalise preventive maintenance scheduling, and (iii) adopting the FCIS as a standard management monitoring instrument. The Fleet Cost Integration Score provides a practical, single-index diagnostic for measuring integrated TCO adoption quality and benchmarking organisational performance over time. Periodic FCIS assessment enables organisations to establish improvement targets, monitor progress, and identify the specific constructs requiring priority attention.

5.2 Limitations and Directions for Future Research

Several limitations of the present study warrant acknowledgement. The cross-sectional design precludes causal inference and prevents observation of how TCO adoption and

organisational performance co-evolve as management practices mature. The purposive sample of four Harare-based companies with large fleets constrains the generalisability of findings to smaller operators, companies in other Zimbabwean cities, and organisations within different sub-sectors of the road freight transport industry. Future research should address these limitations through longitudinal study designs that track FCIS scores and Organisational Performance as TCO adoption develops, through expanded multi-city and multi-size samples to strengthen external validity, and through mixed-methods designs that examine qualitatively the mechanisms by which data infrastructure deficiencies are formed, sustained, and overcome in Zimbabwe's haulage sector.

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