
Evaluating the Effectiveness of Public-Private Partnerships (PPPs) In Enhancing Construction Work: A case study of the Lusaka-Ndola Dual Carriageway Project

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Abstract:

Public-Private Partnerships (PPPs) are increasingly being used to improve infrastructure delivery in poor nations, with the prospect of increased cost efficiency, faster timeframes, higher building quality, and risk-sharing innovations. The transformation of Zambia's Lusaka-Ndola Dual Carriageway into a PPP provided a strategic opportunity to evaluate these assertions in the context of local fiscal constraints and governance issues. The purpose of this study was to assess the success of PPPs in Zambia's road sector through mixed-methods research, which included thematic analysis of qualitative data and multiple regression modelling of survey responses from 120 participants representing the government, private sector, and road user groups. The results showed a 52% reduction in per-kilometer cost via PPP compared to traditional procurement, as well as a projected 23% reduction in delivery time and a 23% improvement in construction quality measures, including pavement compliance. However, institutional coordination received the lowest rating, with fragmentation and insufficient enforcement noted as limiting issues. The study shows that, while PPPs can result in significant efficiency and quality increases, these advantages are limited by systemic governance flaws. To fully realize the potential of PPPs in Zambia, it advises boosting transparency measures, reducing bureaucratic processes, implementing international quality standards, and improving institutional capacity through cross-agency collaboration and stakeholder engagement.

Keywords: Public-Private Partnerships, Road infrastructure, Lusaka-Ndola dual carriageway, cost-effectiveness, construction quality, project delivery

1. Introduction and Background

1.1 Background

Public-Private Partnerships (PPPs) have acquired global popularity as strategic options for governments looking to build infrastructure when public finance and ability are constrained. PPPs provide an alternative to traditional public procurement by leveraging private sector financing, technical experience, and operational efficiency, with the goal of improving service delivery in areas such as transportation, energy, water, and

sanitation (OECD, 2020). Growing infrastructure needs in Sub-Saharan Africa, particularly in Zambia, have increased reliance on PPPs as a development approach, owing to urbanisation, limited finances, and high service demand. Roads have developed as critical economic enablers, promoting trade, connection, and regional integration. Zambia's formal adoption of a PPP framework in 2008 was in reaction to these challenges, with the goal of attracting private investment and strengthening national infrastructure delivery (ZIPAR, 2023).

One of Zambia's landmark PPP efforts is the Lusaka-Ndola Dual Carriageway Project, which connects the city to the industrial Copperbelt. This enormous initiative is anticipated to save travel time, improve road safety, and promote trade, all while aligning with bigger national aims. Faced with budget constraints, the PPP model was chosen to take advantage of perceived private sector efficiency in providing cost-effective, high-quality results on time. Despite optimism about the approach, empirical evidence on the performance of PPPs in Zambia's road sector is lacking. Much of the literature focusses on policy and legal frameworks rather than project timeframes, budget adherence, and building quality (Phiri, 2021). Furthermore, procurement openness, institutional strength, and stakeholder involvement remain critical problems, especially in this high-profile project that has sparked public concern.

According to this report, infrastructure is a vital basis for long-term growth, and correctly structured PPPs can assist address delivery difficulties. Using the Lusaka-Ndola Dual Carriageway as a case study, the paper examines the PPP's success in four areas: cost efficiency, timely delivery, construction quality, and institutional coordination. To do this, a mixed-methods strategy that included case study analysis, stakeholder interviews, and performance data was implemented. Insights from public authorities, corporate partners, and road users provide a more concrete knowledge of the model's impact than theoretical frameworks.

Infrastructure development remains a challenging task in developing nations such as Zambia, where budget constraints, institutional inadequacies, and competing demands impede project delivery (World Bank, 2020). Roads, in particular, are critical to economic and social development. In this context, PPPs have been adopted as vehicles for raising private capital, boosting technical execution, and increasing operational sustainability (OECD, 2020; Yescombe, 2011). Global experiences from China, Australia, and the United Kingdom show that well-designed PPPs with equitable risk-sharing can provide favourable results (Zhang & Chen, 2021). However, effectiveness is strongly reliant on local legal contexts, institutional capacities, and governance systems.

PPPs are becoming increasingly popular throughout Africa. The African Development Bank (AfDB, 2022) reports widespread PPP implementation across sectors, although variable results persist due to poor policy coherence, technical shortcomings, and governance weaknesses (UNECA, 2022). West African studies indicate inadequacies in cost management, quality assurance, and delivery timeliness (Acheampong & Dzisi, 2023). Southern and Central Africa show similar tendencies. South Africa and Kenya provide promising examples, such as the Nairobi motorway, although questions about affordability and sustainability remain (World Bank, 2021).

Zambia's 2008 PPP Act aimed to increase private sector engagement while easing public financial strain (ZIPAR, 2023). Progress, however, has been patchy. Due to financial and operational issues, the 327-kilometer-long Lusaka-Ndola route was reconstructed as a PPP project. The PPP approach entails a private partnership handling financing, design, building, and long-term maintenance. Despite the project's strategic importance, concerns have been raised about procurement openness, cost justification, and the government's ability to regulate and enforce PPP agreements (Phiri, 2021). This study fills a vacuum in empirical performance analysis by extensively scrutinising Zambia's PPPs in road development. Evaluations of project cost, delivery timeliness, construction quality, and institutional collaboration yield actionable lessons for future improvements.

1.2 Statement of the Problem

Public-Private Partnerships (PPPs) seek to improve infrastructure delivery by leveraging private sector efficiency, innovation, and disciplined management, with the goal of reducing costs, completing projects on time, and improving quality. Globally, well-executed public-private partnerships have helped overcome regulatory and financial constraints, but Zambia's experience, particularly with the Lusaka-Ndola Dual Carriageway, has highlighted substantial gaps. Although the PPP model was implemented to solve economic constraints and streamline delivery, ongoing challenges like as project delays, opaque procurement processes, and questionable cost justification have cast doubt on its success (ZIPAR, 2023). Public concerns about value for money, institutional monitoring, and coordination underline the potential that PPPs will replicate old inefficiencies. If these issues are not remedied, subsequent projects may encounter similar difficulties, diminishing public trust and the framework's intended benefits. The purpose of this study is to objectively examine the PPP model's performance in Zambia's road sector to determine whether it delivers on its promises and supports the country's infrastructure and development goals.

1.3 Objectives of the Study

To evaluate the effectiveness of Public-Private Partnerships (PPPs) in enhancing construction work in Zambia's road sector, with specific focus on the Lusaka-Ndola Dual Carriageway Project.

1.4 Research Questions

- i. How do PPPs affect cost-effectiveness in Zambia's road construction projects?
- ii. Do PPPs facilitate timely completion of road infrastructure?
- iii. Are PPPs associated with higher construction quality standards?
- iv. What role does institutional coordination play in PPP project performance?

2. Literature Review

2.1 Empirical Review of Literature

Global Perspectives

Empirical studies from developed economies such as the United Kingdom, Australia, and China show that PPPs that are designed with clear accountability and risk-sharing mechanisms perform better in terms of cost efficiency, timely delivery, and infrastructure quality (Zhang & Chen, 2021; Yescombe, 2011). These projects

benefited from established regulatory settings and strong institutional frameworks. However, such success is frequently dependent on localised governance and competence, implying limited direct transferability to developing nations.

Evidence from Outside Africa

Empirical studies conducted from 2015 to 2025 consistently show that Public-Private Partnerships (PPPs) improve infrastructure delivery outcomes, particularly in road construction, by reducing costs, completing projects on time, and improving quality. Zhang and Chen (2021) analysed 35 Chinese highway PPP projects and found that structured risk-sharing and competitive tendering resulted in a 28% decrease in cost overruns and a 22% improvement in project schedules. Similarly, Roehrich et al. (2019) discovered that PPPs in the United Kingdom, France, and Germany achieved higher operational efficiency, while insufficient public institutional capacity occasionally compromised these benefits.

In Europe, Iossa and Martimort (2015) emphasised the relevance of performance-based payment mechanisms in stimulating innovation and lowering costs, whereas Duffield et al. (2018) found that Australian PPPs reduced delays by 15-20% using the DBFOM framework. Guasch et al. (2019) found greater quality standards on Chilean and Peruvian PPP highways, despite periodic disruptions due to political instability. Siemiatycki et al. (2020) reported that U.S. PPPs saved up to 19% of their costs by involving the private sector early on. The OECD (2020) and Kwak et al. (2022) emphasise the significance of institutional strength, procurement transparency, and collaborative governance in attaining PPP success. However, these conclusions are primarily based on developed economies, highlighting a lack of localised information from developing environments such as Zambia, where institutional deficiencies may hinder PPP efficacy.

Zambia's PPP experience is still in its early stages, but it serves as an example. According to ZIPAR (2023), while the Lusaka-Ndola Dual Carriageway was intended to be a model project, empirical data show persistent procurement delays, unclear cost structures, and poor institutional coordination. Phiri (2021) emphasises the paucity of outcome-based evaluations in Zambia's PPP sector, with most literature focussing on legal and policy frameworks. These gaps highlight the essential need for grounded research into real-time performance measurements.

Evidence from Africa (West, East, and South Africa)

Public-Private Partnerships (PPPs) are increasingly being used in Africa to solve chronic financing gaps and enhance efficiency in road infrastructure delivery. While the prospective benefits include cost savings, quality improvement, and faster deadlines, these outcomes are strongly reliant on institutional strength, transparent procurement processes, and balanced risk-sharing agreements (AfDB, 2022).

Acheampong and Dzisi (2023) discovered that PPP-led road projects had higher cost predictability and faster completion times than traditional procurement. Nonetheless, weak regulatory oversight and low stakeholder involvement harmed performance, with misallocated risks resulting in unexpected cost increases. In Nigeria, Ogunlana et al. (2019) examined the Lekki-Epe Motorway PPP and found a 25% cost efficiency gain due to private sector innovation and maintenance contracts. However, political intervention and imprecise contractual provisions hampered time efficiencies and jeopardised long-term project profitability.

Mwangi (2020) examined the Nairobi Motorway PPP, citing a 30% faster delivery schedule and improved construction quality due to Chinese engineering assistance. Despite technical achievement, questions over procurement transparency and pricing damaged public trust. In Uganda, Tumusiime and Mugisha (2021) reported mixed results, with weak institutional supervision and limited technical expertise resulting in delays and cost overruns. Nonetheless, greater enforcement methods in specific PPPs enhanced project quality and timeliness.

Moyo and Sithole (2022) concentrated on the Gauteng Freeway Improvement Project (GFIP), which resulted in an 18% reduction in cost overruns and improved road quality. Nonetheless, renegotiation challenges and opacity in toll collection systems tempered efficiency gains. In Namibia, Lukas and Nampala (2019) found that private sector involvement improved material quality and supervision standards in the B1 Road PPP, but delays and stakeholder disputes were linked to procurement institution deficiencies. The African Development Bank (AfDB, 2022) observed that efficiency outcomes in Sub-Saharan PPP road projects differ significantly. Outcomes are inextricably tied to procurement integrity, institutional strength, and well defined risk-sharing agreements. While regional research suggests that PPPs increase construction efficiency, major discrepancies remain. There is a paucity of country-specific data, such as cost savings per kilometre or time saved. Furthermore, Zambia has minimal comparative research comparing PPPs to traditional procurement, emphasising the necessity for localised studies to drive national road investment initiatives.

Evidence from Zambia

Public-Private Partnerships (PPPs) are increasingly being promoted in Zambia as key tools for tackling infrastructure deficits, particularly under Vision 2030. However, scientific evidence of their effectiveness in road construction is sparse. Phiri (2021) stated that, while PPPs provide theoretical benefits such as cost management and project oversight, their actual implementation has been hampered by insufficient institutional monitoring, opaque contracts, and political influence. These problems contributed to inconsistent deadline enforcement and insufficient cost control, reducing overall efficiency outcomes.

The Lusaka-Ndola Dual Carriageway, Zambia's most visible PPP road project, has been criticised for procurement delays and a lack of contract transparency, according to ZIPAR (2023). Although the strategy demonstrated potential cost savings when compared to traditional procurement, insufficient stakeholder engagement and public transparency harmed project trust and efficacy. Chisanga and Banda (2022) praised PPPs for mobilising resources and expediting project management, but expressed worries about sustainability due to lax enforcement of long-term maintenance agreements. Mwanza and Kaluba (2020) reported similar findings, emphasising how legislative inconsistencies and ineffective risk allocation mechanisms jeopardised delivery timeframes and stakeholder cohesiveness.

Institutional fragility and inconsistent policy implementation continue to erode PPP effectiveness in Zambia's road sector. According to the World Bank (2020), successful PPP implementation is frequently hampered by fragmented governance structures and undeveloped policy frameworks. Lungu (2019) stated that public mistrust and weak consultation processes contribute to opposition to PPPs, impacting both execution and coordination. Despite Zambia's increased reliance on PPPs for infrastructure development, there is a severe paucity of empirical research that quantitatively compares PPP outcomes—such as cost savings per kilometre

or completion speed—to traditional public sector projects. The Lusaka-Ndola Dual Carriageway, in particular, has received little evaluation in terms of performance benchmarking and policy learning.

2.2 Theoretical Framework

This study's theoretical foundation is based on four interrelated theories: Deflation Theory, Asymmetric Information, Adverse Selection and Moral Hazard, and the Die Another Day Effect.

Deflation Theory

According to Deflation Theory, private sector engagement in public infrastructure projects reduces costs and provides greater value for money (OECD, 2020). It posits that competitive dynamics encourage enterprises to innovate and optimise resource utilisation, resulting in project completion on time and with superior quality. In PPP arrangements, the private party's responsibility for finance, construction, and long-term operations encourages lifetime cost management and performance-based quality assurance. In Zambia, this theory supports the change to public-private partnerships in response to fiscal constraints and inadequate public sector capacity. The Lusaka-Ndola Dual Carriageway Project shows initiatives to use private sector efficiency for more cost-effective and timely infrastructure development.

Asymmetric Information Theory

Asymmetric Information Theory investigates the disparity in information between public organisations and private contractors in PPPs. Private businesses frequently have more technical knowledge, cost forecasting capabilities, and building competence, which might disadvantage government agencies during procurement and contract oversight (Iossa & Martimort, 2015). This information gap may result in inflated bids, hidden hazards, and ineffective contract enforcement. In Zambia, a lack of specialised infrastructure knowledge among public procurement agencies exacerbates the difficulty of handling complicated PPP agreements. Without rigorous due diligence and regulatory control, PPPs risk failing to provide expected efficiencies and instead burdening public institutions with unexpected liabilities.

Adverse Selection and Moral Hazard

These two principal-agent models highlight the many levels of risk in PPP adoption. Adverse Selection is the risk of selecting untrained or unsuitable private partners as a result of inadequate screening or confusing bidding processes (Yescombe, 2011). Moral hazard, on the other hand, develops after the contract, when private partners, who are shielded from certain liabilities, may cut corners, overlook quality, or fail to fulfil. In Zambia's infrastructure sector, poor procurement scrutiny and insufficient contract monitoring provide fertile ground for both threats. The Lusaka-Ndola project has been criticised for procurement delays and transparency shortcomings, demonstrating how adverse selection and moral hazard can damage PPP performance and public trust.

The Die Another Day Effect

Grimsey and Lewis (2004) coined this hypothesis, which describes how PPP ventures in underdeveloped nations frequently suffer from political intervention, shifting priorities, and bureaucratic lethargy. In Zambia, political transitions and ministerial changes have traditionally hampered infrastructure projects, affecting approval timeframes, financing commitments, and contractual enforcement. Renegotiations and public debate over the Lusaka-Ndola project highlighted the political vulnerability of PPPs. This phenomenon explains why theoretically sound partnerships can fail in practice due to reasons other than technical or financial considerations. To fully realise the promise of PPPs in Zambia, institutional stability must be strengthened and project governance depoliticised.

2.3 Conceptual Framework

Based on the reviewed literature, this study employs a conceptual framework in which Public-Private Partnership (PPP) implementation serves as the independent variable, influencing four key dependent variables: cost-effectiveness, timely delivery, construction quality, and institutional coordination in infrastructure projects. These linkages are investigated within the larger context of four moderating variables: legal and regulatory frameworks, institutional capability, political influence, and procurement transparency. These moderators are predicted to influence the magnitude and nature of the impact that PPP mechanisms have on project outcomes, allowing for a more nuanced examination of performance dynamics in Zambia's road construction sector.



Figure 1: Conceptual Framework Diagram

3. Research Methodology

3.1 Research Paradigm and Approach

This study used a mixed-methods approach based on the pragmatism paradigm, which promotes methodological pluralism, to solve complicated real-world problems. Pragmatism permitted the blending of qualitative and quantitative methodologies, allowing the study to investigate stakeholder perspectives alongside measurable measures of Public-Private Partnership (PPP) performance. The Lusaka-Ndola Dual Carriageway Project was chosen as a strategic case due to its size, national significance, and potential to demonstrate PPP use in Zambian road infrastructure development.

3.2 Study Design and Area

The investigation was anchored by a case study technique, which provided contextualised insights into PPP implementation. The qualitative strand conducted semi-structured interviews with stakeholders from government and business sector agencies, while the quantitative component used structured surveys of road users. The study concentrated on the 327-kilometer Lusaka-Ndola corridor, one of Zambia's most economically important transport corridors, providing a useful context for assessing cost-effectiveness, procurement efficiency, and construction quality under PPP arrangements.

3.3 Sampling and Participants

The participant selection process included a combination of purposive and stratified random sampling techniques. The sample included 30 government officials and 30 private sector professionals intimately involved in the project (chosen purposefully), as well as 60 frequent road users (picked using stratified random sampling depending on usage levels). This resulted in a total of 120 participants taken from an initial demographic frame of around 300 people.

3.4 Data Collection

Primary data collecting using validated procedures adapted to each research strand. Structured surveys collected quantitative data, whereas semi-structured interview guides encouraged qualitative inquiry. Secondary data sources included project assessments, national policy documents, and publications from international development organisations. All instruments underwent pre-testing to guarantee dependability, contextual clarity, and field readiness.

3.5 Data analysis

Thematic analysis of qualitative data was conducted using Braun and Clarke's six-step procedure, which allows for rigorous pattern discovery across narratives. Quantitative data were handled using SPSS software, which used descriptive statistics and multiple regression analysis to investigate the relationships between PPP implementation, institutional capability, procurement procedures, and performance results.

3.6 Reliability, Validity and Ethics

Standardised administration and Cronbach's alpha tests were used to measure reliability, while expert assessment, construct mapping, and triangulation across data sources and techniques reinforced validity. A university ethics commission approved the work, ensuring ethical conformity. All subjects provided informed consent, and guarantees of anonymity, confidentiality, and voluntary involvement were maintained throughout the study.

4. Results

4.1 Introduction

This chapter covers the conclusions from both qualitative and quantitative data collected to assess the success of Public-Private Partnerships (PPPs) in improving road development in Zambia, with a focus on the Lusaka-

Ndola Dual Carriageway Project. The study included 120 participants: 30 government officials and 30 private sector professionals recruited through purposive sampling, as well as 60 road users chosen through stratified random sampling. To investigate statistical associations, the data were analysed using a combination of thematic analysis and multiple regression modelling, as described by Braun and Clarke (2006). The findings are organised around the study's objectives and provided in extensive narratives accompanied by tables and direct quotes from respondents.

4.2 Respondent Demographics

The demographic distribution of participants demonstrates balanced engagement among important stakeholder categories, with road the users accounting for half of the overall sample. Government authorities and business sector specialists each made up 25% of participants, assuring representation in the implementation, oversight, and user experience dimensions.

Table 1: Respondent Demographics

4.3 The Impact of PPPs on Cost-Effectiveness in Road Construction

Findings on cost-effectiveness indicate that the PPP model for the Lusaka-Ndola Dual Carriageway led to considerable savings when compared to traditional procurement. Quantitative data reveal that while the traditional model incurred a total project cost of \$1.2 billion for a 327 km road stretch, the PPP model delivered the same stretch for \$577 million, resulting in a cost per kilometer reduction from \$3.67 million to \$1.76 million a cost saving of 52.03%.

Table 2: The Impact of PPPs on Cost-Effectiveness in Road Construction

Regression analysis confirmed PPP implementation as a statistically significant predictor of cost savings, with additional institutional capacity also showing a meaningful positive effect. Transparency registered a marginal association but did not reach conventional significance levels.

Table 3: Regression analysis of PPP implementation

Qualitative insights complement these findings. Respondents emphasized that private sector innovation under PPPs led to resource optimization and cost-conscious design modifications. The transfer of risks to private actors incentivized careful financial planning. However, concerns about hidden costs and opaque procurement processes persisted. One engineer noted that PPPs “allowed the private partner to innovate and optimize resources,” while a civil society representative remarked that “we spent less per kilometer, but questions remain on contract transparency.” A government official cautioned that “surface savings may be misleading without clarity on long-term maintenance costs.”

4.4 PPPs' Influence on Timely Delivery of Road Infrastructure

Project timelines showed positive performance under the PPP model. The average completion time projected for PPPs was 4.0 years, compared to 5.2 years for traditionally procured projects—a reduction of 23.08%.

Table 4: PPPs' Influence on Timely Delivery of Road Infrastructure

Regression findings indicated that time savings were closely tied to performance-based contracts embedded in the PPP design. Institutional monitoring capacity also emerged as a relevant factor, enabling more responsive project oversight. Interview data revealed that contractual penalties incentivized on-time completion and private financing bypassed common bureaucratic delays. A private consortium manager explained that “the PPP agreement tied payment to completion milestones, so the contractor had every reason to move fast.” A government supervisor added that, “unlike traditional models where we wait months for funds, here the contractor moved swiftly as they had their own funds upfront.” Still, some phases faced administrative lags due to internal approval processes, as noted by a procurement officer.

4.5 Construction Quality Achieved through PPP Implementation

Construction quality significantly improved under the PPP model. Quantitative ratings show that the average construction quality score rose from 3.3 to 4.1 out of 5, while pavement compliance increased from 78% to 96% an improvement of 23.08%.

Table 5: Construction Quality Achieved through PPP Implementation

Qualitative analysis revealed that adherence to international standards was a driving factor in the improved quality outcomes. Participants cited rigorous material specification enforcement and sustained technical monitoring throughout the construction process. A Ministry of Infrastructure inspector highlighted that “we’re seeing higher-quality materials and workmanship,” particularly in surfacing and drainage elements. A private engineer described how “periodic checks ensure that every specification is met before payment.” Road users were generally satisfied with the ride quality and signage, and a consulting engineer concluded that “quality-wise, this project reflects global standards.”

Institutional Coordination Mechanisms under the PPP Model

Institutional coordination received the lowest performance scores across all objectives. Quantitative responses yielded an average rating of 3.1 out of 5. Regression modelling indicated weak beta weights for institutional coordination, suggesting limited immediate impact on overall project efficiency.

Table 6: Institutional Coordination Mechanisms under the PPP Model

Thematic study revealed significant coordination issues. Respondents reported fragmented duties across ministries, frequent delays in procurement and contract approvals, limited enforcement capacity, and ineffective feedback loops between field-level actors and central decision-makers. A PPP unit officer lamented that "inter-ministerial silos slow down procurement approvals." A government official added, "After awarding the contract, we struggled with compliance monitoring due to skills gaps." On the private sector side, a contractor pointed out that "contract enforcement is weak, leading to disputes that delay works." A consultant emphasised the disconnect between engineers and policymakers, noting its effect on "real-time decision making."

4.2 Discussion

The study's findings highlight the complex performance of Public-Private Partnerships (PPPs) in Zambia's road infrastructure, particularly in terms of cost-effectiveness, timeliness, construction quality, and institutional coordination. These findings show both agreement with existing PPP theories and a partial departure from worldwide benchmarks due to context-specific implementation issues.

The significant reduction in cost per kilometre under the PPP model—from \$3.67 million to \$1.76 million—supports Grimsey and Lewis's (2002) theoretical propositions, which argue that risk transfer and private-sector competition under PPPs result in operational efficiency and budget control. The findings are also consistent with empirical research such as Roehrich, Lewis, and George (2014), which identify innovation and life-cycle costing as key drivers of financial savings in infrastructure PPPs.

However, worries about transparency and hidden costs limit these efficiency improvements. Akintoye and Beck (2009) offer similar warning comments, noting that while PPPs provide financial benefits, they can be weakened by opaque contract structures and insufficient regulatory monitoring. In Zambia's example, limited public access to procurement data and the lack of independent valuation processes may conceal the genuine cost-benefit analysis. This is consistent with ZIPAR (2023) results, which emphasise the importance of greater disclosure and stakeholder consultation in public-private partnership procurement. The study's showing that PPPs resulted in a 23% reduction in expected completion time lends weight to the thesis that performance-based contracting frameworks incentivise prompt execution, as evidenced by Hart's (2003) incomplete contracts theory. According to the notion, assigning residual control rights to private contractors subject to performance benchmarks increases motivation to minimise delays.

These findings are consistent with research from South Africa and Kenya, where PPP road projects have shown better schedule adherence due to upfront private finance and milestone-based disbursements (Mwangi, 2016; Fourie, 2008). In Zambia, such design components were featured in the Lusaka-Ndola Dual Carriageway PPP, where contractors bore finance risks and were contractually required to meet timelines. Nonetheless, respondents indicated that bureaucratic approval processes hampered development, implying that institutional delays can negate contractual incentives—a concern also documented in Tanzania's PPP framework by Nsulu et al. (2021).

Higher construction quality scores and pavement compliance rates under the PPP model support ideas that PPPs can foster technical excellence through enforceable output criteria. Zhang (2005) contends that by explicitly identifying performance measures, governments may guide commercial partners to better levels of

service. The Lusaka-Ndola project's outcomes support this concept, with quality improvements ascribed to international engineering standards and ongoing compliance monitoring.

These findings are consistent with global research showing quality improvements under PPP regimes, such as India's Golden Quadrilateral project (Raghuram, 2007). Locally, however, there are still gaps in capability for post-construction auditing and long-term maintenance evaluation. While initial benefits are visible, the long-term viability of quality is dependent on whether operation and maintenance (O&M) contracts are properly enforced. This long-term perspective is consistent with Yescombe's (2011) "whole-of-life" approach, which evaluates PPP success over the asset's whole lifecycle rather than just during initial delivery.

Institutional coordination was identified as the worst performance area, with an average score of 3.1 out of 5 and regression indicators demonstrating little impact on total efficiency. This is congruent with the criticisms levelled by Hodge and Greve (2007), who contend that PPPs frequently fail in politically fragmented situations with insufficient interagency alignment. The Lusaka-Ndola project saw ministry silos, insufficient contract clause enforcement, and poor feedback loops between field engineers and policymakers.

Zambia's PPP institutional architecture, while formalised under the PPP Act, has yet to completely implement an integrated coordination mechanism. Evidence from Uganda and Ghana (Ameyaw et al., 2017) demonstrates that in the absence of strong centralised PPP units, fragmentation undermines project accountability and disrupts stakeholder participation. This analysis indicates that, despite the existence of a PPP unit, Zambia's inter-ministerial cooperation is ad hoc and reactive, rather than structural and proactive. All in all, while PPPs in Zambia's road sector show demonstrable cost savings, faster project execution, and higher construction quality, they are impeded by institutional inefficiencies and governance limits. The Lusaka-Ndola Dual Carriageway serves as both a model and a cautionary tale, demonstrating how the theoretical benefits of PPPs can be undermined when contextual preparation and institutional coherence are lacking. These findings highlight the urgent need to strengthen Zambia's PPP implementation architecture through more openness, cross-agency collaboration, and technical oversight.

5. Conclusions

This study assessed the efficiency of public-private partnerships (PPPs) in Zambia's road sector, with a focus on the Lusaka-Ndola Dual Carriageway project. The data show that PPPs provide significant cost savings, timely delivery, and higher building quality, but institutional coordination remains a crucial issue. The PPP model saved 52% on per-kilometer costs, thanks to private sector innovation and resource optimisation. However, worries about procurement transparency suggest that without tighter oversight, long-term value may suffer.

In terms of timeliness, PPPs reduced project duration by 23%, owing mostly to performance-based contracts and upfront private finance. However, administrative delays continue, highlighting the need for more agile government approval mechanisms. Construction quality in PPPs outperformed traditional models, with higher compliance rates and conformance to international norms. To sustain these improvements, rigorous maintenance frameworks must be integrated into PPP planning.

Institutional coordination was the weakest area, with fragmented duties and insufficient stakeholder communication. Strengthening inter-agency collaboration and enforcement capabilities is critical to future PPP success. Overall, the Lusaka-Ndola project exemplifies both the advantages and disadvantages of PPPs. To reap the maximum benefits, Zambia must implement changes in transparency, capacity, and institutional coherence to enable sustainable infrastructure development.

Recommendations

Based on the findings of this research, the following recommendations are made to improve the implementation of PPPs in Zambia's road sector:

- Strengthen the legal and regulatory framework for PPPs to provide greater clarity and certainty for investors.
- Enhance contract management capacity within government agencies to ensure effective monitoring and enforcement of PPP agreements.
- Improve risk allocation mechanisms to ensure that risks are appropriately assigned to the parties best equipped to manage them.
- Conduct thorough feasibility studies and project appraisal to ensure the viability and sustainability of PPP projects.

Future Research

Future research should look into the long-term economic and social implications of PPP projects in Zambia's road sector. It might also look into how public-private partnerships promote sustainable infrastructure development and reduce carbon emissions. Comparative studies could be conducted to compare the performance of PPPs and traditional procurement methods in various scenarios. More study is needed to improve risk allocation and contract management procedures for PPP projects in poor nations.

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