



Assessing the Effect of Client-Consultant-Contractor Relationships on Quality Assurance in Road Construction: Evidence from the Dar es Salaam Metropolitan Development Project, Tanzania

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Abstract

Ensuring quality assurance in road construction remains a persistent challenge in Tanzania, largely due to fragmented collaboration and communication among key stakeholders, namely the client, consultant, and contractor. Despite the critical role these actors play in achieving quality infrastructure outcomes, limited empirical evidence exists on how their relational dynamics influence project quality. This study examined the effects of the client, consultant, and contractor relationship, specifically communication, meetings, and reporting, on quality assurance in road construction projects. A case study design was adopted, employing a quantitative approach, with data collected from 122 randomly selected stakeholders involved in 50 road projects under the Dar es Salaam Metropolitan Development Project. Factor analysis was conducted to validate constructs, retaining only variables with factor loadings ≥ 0.600 . Multiple regression analysis revealed that communication and reporting are significant predictors of quality assurance, explaining 91.1% of the variance ($R^2 = 0.911$). Communication had the strongest effect ($\beta = 0.475$, $p = 0.000$), indicating that improved communication substantially enhances project quality. Reporting also showed a statistically significant positive influence ($\beta = 0.318$, $p = 0.013$), though to a lesser extent. These findings underscore the importance of structured communication systems and regular reporting in ensuring quality road infrastructure. The study concludes that fostering effective collaboration among clients, consultants, and contractors through enhanced communication channels and comprehensive reporting mechanisms is vital for achieving quality assurance. It recommends strengthening stakeholder coordination, institutionalising information-sharing practices, and investing in communication training and digital platforms to support sustainable infrastructure development.

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Introduction

Road construction plays a pivotal role in stimulating economic growth, enhancing national integration, and improving access to essential services such as health, education, and markets (World Bank, 2019; African Development Bank Group, 2021). For developing countries like Tanzania, quality road infrastructure is crucial in facilitating trade and reducing transport costs. However, ensuring quality assurance in road construction projects remains a persistent challenge due to the complex



nature of construction activities, limited resources, and the involvement of multiple stakeholders, primarily the client, consultant, and contractor (Juma & Nsimbila, 2025).

The relationship among these three actors, client, consultant, and contractor, is fundamental to the success of road infrastructure projects. Effective collaboration fosters the application of technical expertise, efficient project management, and adherence to international construction standards (Jagtap & Kamble, 2019). A strong working relationship promotes timely decision-making, problem-solving, and smooth project execution, which collectively minimise cost escalation and delays while enhancing the overall quality of the final product (Masengesho et al., 2021). Conversely, poor coordination, miscommunication, or inadequate oversight can significantly undermine the quality and sustainability of infrastructure projects (Asmi & Djamaris, 2021).

The Dar es Salaam Metropolitan Development Project (DMDP) exemplifies Tanzania's commitment to addressing urban infrastructure challenges. The project encompasses roads, drainage, and other critical services needed to support the city's rapid urbanisation and economic activities (UN-Habitat, 2022). Given the scale and importance of the DMDP, the quality of its outcomes is closely tied to the strength of collaboration among the client, consultant, and contractor (Masengesho et al., 2021). As such, consultants play a vital role in ensuring quality assurance through project monitoring and technical oversight. This requires transparent and merit-based recruitment processes to ensure competent professionals are engaged (Niazi & Painting, 2017). Furthermore, accountability frameworks involving all three parties must be upheld to facilitate proactive responses to emerging challenges. The contractor's compliance with technical and safety standards, along with the client's adherence to procurement and monitoring guidelines, are equally essential in maintaining quality benchmarks (Chan et al., 2021; Juma & Nsimbila, 2025).

Despite the recognised importance of the client–consultant–contractor relationship, there remains limited empirical research in Tanzania exploring how this triadic interaction affects quality assurance in road construction. Much of the existing literature has focused on cost overruns and risk management (Nyakala et al., 2019; Siayor, 2020), with little emphasis on stakeholder relationships as determinants of quality (Evarist et al., 2023). This study addresses this research gap by examining how elements of this relationship, such as communication, reporting, and coordination, impact quality assurance in road projects, with specific reference to the DMDP. By doing so, it aims to offer actionable insights for strengthening the consultancy function and promoting sustainable infrastructure development in Tanzania.

Theoretical perspective

This study is grounded in Agency Theory, which offers a robust framework for examining the contractual and relational dynamics among the client, consultant, and contractor in road construction projects. Developed by Jensen and Meckling (1976), Agency Theory focuses on the principal–agent relationship, wherein a principal delegates authority or tasks to an agent to act on their behalf. However, such delegation often leads to challenges arising from goal divergence, information asymmetry, and varying levels of commitment. These challenges can result in agency problems that threaten the achievement of desired outcomes, in this case, the quality assurance of road projects. In the context of this study, the client assumes the role of the principal, while the consultant and contractor serve as agents with distinct but interconnected responsibilities. The client relies on the consultant for technical oversight and on the contractor for the physical execution of the project (Hendrastuti & Harahap, 2023). However, in the absence of effective coordination, structured communication, and consistent monitoring, agents may act opportunistically, pursuing their own interests, such as cost-cutting or reduced effort, which can ultimately compromise the quality of the project. Agency Theory is thus used to provide a theoretical understanding of how weak oversight,



poor reporting mechanisms, and ineffective communication channels can exacerbate agency problems. The theory suggests that proper monitoring and control mechanisms are essential to mitigating such risks. In this regard, the study examines how relational factors, meetings, reporting, and communication, serve as control tools to align the interests of the consultant and contractor with those of the client. These mechanisms, when effectively implemented, can reduce agency costs, enhance accountability, and contribute to the successful delivery of high-quality road infrastructure in Tanzania.

Materials and methods

Research Design

This study adopted a case study research design, which is suitable for obtaining detailed and context-specific insights within a defined setting. A case study design enables the researcher to explore the phenomenon in depth and within its real-life context, here, the Dar es Salaam Metropolitan Development Project (DMDP). According to Ridder (2017), a research design establishes the conditions for data collection and analysis while ensuring procedural efficiency and relevance to the research objective. Given the constraints of time and financial resources, the case study design was appropriate as it allowed the study to remain focused, practical, and manageable while achieving the intended research goals.

Target population and sampling

The target population for this study comprised all 175 stakeholders involved in the Dar es Salaam Metropolitan Development Project (DMDP). This population included key groups such as management, engineers, consultants, administration staff, Project Management Unit (PMU) members, and project managers.

Sample size determination

The sample size for this study was determined using Yamane's (1967) formula, which is appropriate for calculating sample sizes from a finite population with a specified level of precision. The formula is expressed as:

$$n = \frac{N}{1+N(e)^2} \quad (1)$$

where:

n = the required sample size

N = the total population size

e = the level of precision (margin of error), set at 5% (0.05)

Given a total population of 175 stakeholders that include management, engineers, consultants, administration, PMU, project managers, the calculation is as follows:

$$n = \frac{175}{1+175(0.05)^2} \quad (2)$$

$$n = \frac{175}{1.4375} \quad (3)$$



$$n = 121.74$$

(4)

Thus, the final sample size was rounded to 122 respondents, ensuring a 95% confidence level and a $\pm 5\%$ margin of error, which balances reliability and feasibility in data collection.

Sampling technique

We obtained a comprehensive and up-to-date list of all 175 eligible stakeholders involved in the DMDP from the Human Resources Department. This list included individuals across key strata, management, engineers, consultants, administration, PMU, and project managers. Using simple random sampling, each name was placed on identical slips of paper and thoroughly mixed. An independent person then randomly selected 122 names, ensuring that every individual, regardless of stratum, had an equal probability of being chosen. Given that the sampling frame encompassed the entire population and that selection was purely random without bias, this method supports a representative sample reflective of the diverse stakeholder categories. Thus, while not proportionate stratified sampling, the approach adequately captured the heterogeneity of the population.

Data Collection Methods

Primary data were collected using a structured questionnaire administered to the selected 122 respondents involved in the 50 road construction projects under DMDP. The questionnaire included closed-ended questions aligned with the study's objectives, particularly focusing on the quality of communication, reporting, and meeting structures among stakeholders. To enhance clarity and inclusiveness, the questionnaire was prepared in both English and Swahili, accommodating diverse language preferences. After distribution, the completed questionnaires were reviewed and organised for analysis. The design and structure of the questionnaire were informed by best practices in empirical research (Aithal & Aithal, 2020).

Data analysis techniques

Factor analysis

To assess the underlying dimensions of the client–consultant–contractor relationship influencing quality assurance in road construction projects, factor analysis was conducted using Statistical Package for Social Sciences (SPSS) software version 25. Prior to the analysis, data collected through structured questionnaires were cleaned, coded, and standardised to ensure consistency and comparability. The principal component analysis approach, with Varimax rotation, was employed to enhance the interpretability of factor loadings. Items with loading values greater than 0.60 were retained, signifying significant contributions to the underlying constructs. Factor analysis was deemed appropriate for this study as it reduces data dimensionality while preserving core patterns and relationships. It enabled the identification of key latent constructs such as communication, and meeting and reporting, which are central to understanding how stakeholder relationships impact quality assurance.

Multiple regression analysis

Following the factor analysis, multiple regression analysis was performed to examine the predictive relationship between the independent variables, communication and meeting and reporting, and the dependent variable, quality assurance of road construction projects.

Given that the dependent variable is continuous and normally distributed, multiple regression was suitable for estimating the impact of each predictor. The model used was as follows:



$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon \quad (5)$$

where:

Y = the dependent variable (quality assurance of road projects)

β_0 = the regression intercept

β_1, β_2 = the regression coefficients

X_1 = communication

X_2 = meeting and reporting

ε = error term

Ethical consideration

Ethical approval for this study was obtained from the Mzumbe University Research Committee prior to the commencement of data collection. The approval process ensured that the research complied with institutional and national ethical standards for studies involving human participants. In line with ethical research practice, written informed consent was obtained from all participants before their involvement in the study. Participants were fully briefed on the purpose of the research, the procedures to be followed, and their role in the study. The explanation also included assurance of the voluntary nature of participation, with a clear statement that respondents were free to withdraw from the study at any point without any adverse consequences. To promote transparency and trust, participants were informed about the confidentiality and anonymity of their responses, and that the data collected would be used strictly for academic purposes. All data were securely stored and accessible only to the research team, in order to protect the identity and privacy of respondents engaged in the Dar es Salaam Metropolitan Development Project (DMDP).

Results

Factor analysis

To identify the most influential items within these constructs, confirmatory factor analysis (CFA) was conducted using SPSS. Factor loadings were evaluated, and only variables with regression weights ≥ 0.600 were retained for further analysis, while those with lower loading values were excluded, as per standard recommendations. The results of the factor analysis helped in validating the construct structure of the independent variables and provided a statistical foundation for further inferential analysis (see Table 1).



Table 1: Confirmatory Loading Factors

Construct	Variable Code	Loading Weight	Status
Meeting and reporting	OE401E ← Information	0.861	Retained
	OE401D ← Information	0.961	Retained
	OE401C ← Information	0.981	Retained
	OE401B ← Information	0.608	Retained
	OE401A ← Information	0.801	Retained
Communication	OE402B ← Communication	0.525	Not Retained
	OE402C ← Communication	0.569	Not Retained
	OE402D ← Communication	0.726	Retained
	OE402E ← Communication	0.694	Retained
	OE402F ← Communication	0.654	Retained
	OE402G ← Communication	0.697	Retained
	OE402H ← Communication	0.761	Retained
	OE402I ← Communication	0.595	Retained
	OE402J ← Communication	0.868	Retained
	OE402K ← Communication	0.663	Retained
	OE402L ← Communication	0.737	Retained

The results in Table 1 indicate that all variables under the meeting and reporting construct exceeded the threshold and were therefore retained. Notably, OE401C (0.981) and OE401D (0.961) had the strongest associations, highlighting their substantial contribution to the construct. For the communication construct, most variables demonstrated strong loading weights, with the highest recorded for OE402J (0.868). However, OE402B (0.525) and OE402C (0.569) were excluded as they fell below the cut-off point. Overall, the analysis confirms that both meeting and reporting and communication are critical relational dimensions influencing quality assurance in road construction projects. The retention of variables with strong factor loadings ensures that only the most reliable indicators are used in subsequent inferential analyses. These findings provide a robust empirical basis for exploring how effective stakeholder interaction contributes to the success of infrastructure development initiatives such as the DMDP.

Multiple regression analysis

Regression analysis was conducted to examine the extent to which the relationship among clients, consultants, and contractors influences quality assurance in road projects. This statistical technique is particularly suited for such analysis due to its capacity to quantify the relationship between multiple variables. In the context of road construction, where several stakeholders interact, ensuring quality assurance is critical to project success. Table 2 presents the model summary.



Table 2: Summary of the regression model

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.954 ^a	0.911	0.908	1.83134

a. Predictors: (Constant), Reports, Communications

The model summary in Table 2 indicates a strong model fit, with a coefficient of determination (R^2) of 0.911 and an adjusted R^2 of 0.908. This implies that approximately 91.1% of the variance in the dependent variable (Quality) can be explained by the independent variables—Reports and Communication. The high R-value (0.954) also signifies a strong positive correlation between the predictors and the outcome variable.

Additionally, the ANOVA results presented in Table 3 confirm the overall significance of the regression model, $F(2, 119) = 605.540$, $p = 0.000$. This indicates that the model is statistically significant, and the predictors—Reports and Communication—collectively explain a substantial proportion of the variance in Quality. The large sum of squares for regression ($SS = 2866.625$) and the minimal residual variance reinforce the model's robustness.

Table 3: ANOVA^a Test Results

	Model	Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	2866.625	2	1433.313	605.540	0.000 ^a
	Residual	281.720	119	2.367		
	Total	3148.345	121			

a. Dependent Variable: Quality

b. Predictors: (Constant), Reports, Communications

Furthermore, Table 4 presents the regression coefficients, which provide detailed insights into the individual contributions of each predictor variable—Communication and Reports—to quality assurance in road projects.

Table 4: Regression coefficients

Model	Unstandardised Coefficients			Standardised Coefficients	t	Sig.
	β	Std. Error		Beta		
1	(Constant)	3.154	0.611***		5.159	0.000
	Communication	0.475	0.063***	0.721	7.541	0.000
	Reports	0.318	0.125**	0.244	2.547	0.013

Note: ***, ** Significant at 1% and 5%, respectively.

The regression results reveal that both variables significantly contribute to quality assurance. Communication was identified as the strongest predictor ($\beta = 0.475$, $p = 0.000$), indicating a highly statistically significant positive effect. This implies that for every one-unit increase in effective communication between the client, consultant, and contractor, there is a 0.475-unit increase in the level of quality assurance, assuming other factors remain constant. This highlights the critical role of timely, clear, and consistent communication in ensuring project standards are met. Similarly, the variable meeting and reporting also showed a statistically significant positive relationship with quality assurance, ($\beta = 0.318$, $p = 0.013$). This implies that a one-unit improvement in meeting and reporting practices is associated with a 0.318-unit increase in quality assurance. Although its effect size is lower than that of communication, the result confirms that structured reporting systems and consistent



progress meetings contribute meaningfully to enhanced monitoring, documentation, and collective decision-making, elements that are vital for delivering road projects to the required quality standards.

Discussion of findings

Participants consistently reported that project stakeholders, clients, consultants, and contractors, held regular meetings and shared implementation plans collaboratively. These meetings were supported by written minutes, and when physical presence was not possible, communication via email was employed. This hybrid system, combining face-to-face and electronic communication, ensured stakeholders remained updated on project progress and were able to identify and address challenges in a timely manner. Such a practice reflects a high level of procedural discipline and an awareness of the importance of real-time information sharing in managing construction projects. The emphasis on regular meetings and minute-taking reveals a commitment to transparency and documentation, which are vital to aligning stakeholder expectations. Meetings not only facilitated information exchange but also served as platforms for resolving emerging technical or managerial issues. The presence of well-structured communication and documentation mechanisms enables stakeholders to trace decisions, monitor progress, and promote accountability, thereby fostering quality assurance.

Moreover, the findings show that stakeholders proactively engaged in planning for external dependencies such as those involving DAWASA or TANESCO. By collectively identifying where external assistance was required and addressing such needs through collaborative discussion, the 3Cs demonstrated a proactive approach to risk management and contingency planning. This behaviour reflects the growing recognition within Tanzanian infrastructure projects of the need for integrated planning and stakeholder synchronisation. In addition, information sharing was found to be a key facilitator of stakeholder alignment. Effective information sharing, according to Ishaq et al. (2019), ensures that relevant actors receive the appropriate support at the right time, reducing information asymmetry and the likelihood of conflicting actions. In this study, the structured sharing of information ensured clarity of expectations and timely resolution of obstacles. However, despite the positive outcomes, the reliance on meetings as the dominant form of information sharing may present challenges, especially when participants are absent. As noted, delays in decision-making or miscommunication may occur when critical stakeholders miss meetings. This limitation suggests the need to strengthen asynchronous communication tools to supplement real-time interactions.

From a theoretical perspective, the findings align with the agency theory, which posits that agents (consultants and contractors) may not always act in the best interests of the principal (client) unless effective monitoring and communication mechanisms are in place. Clear, consistent communication and structured reporting serve as control mechanisms to mitigate agency problems such as moral hazard or information asymmetry. The regression analysis supported this, showing that communication ($p = 0.000$) and meetings and reporting ($p = 0.013$) were significant predictors of quality assurance. These results confirm that relational mechanisms between agents and principals are central to construction outcomes, particularly in projects with multiple interdependent actors.

Communication was not only regular but also technologically adaptive. Participants noted the use of digital platforms such as Zoom and chat rooms for team interaction, which enhanced real-time updates, consultation, and decision-making. These tools were especially helpful for bridging physical absence and maintaining staff cooperation across departments and firms. As noted by Park and Kim (2024), such digital communication practices reduce consulting gaps and reinforce alignment among stakeholders. However, it is also important to note that digital platforms should complement, not replace, face-to-face meetings, particularly in contexts involving complex technical or interpersonal matters. The findings also confirm previous studies, including those by Masengesho et al. (2021) and Asmi and Djamaris (2021), which highlight the role of communication in avoiding cost overruns and



ensuring adherence to technical standards. In line with this, the current study demonstrates that communication platforms enhance collaboration and expedite issue resolution, thereby improving construction quality and timeliness.

Beyond agency theory, these findings also resonate with role theory, which explains how social roles and expectations shape behaviour and collaboration in institutional settings. Within the construction triad, each actor, client, consultant, contractor, has defined responsibilities and role-based expectations. Misalignment or conflict between these roles can undermine cooperation and project performance. The study found that when roles were clearly defined and reinforced through regular communication and documentation, project performance improved. This reinforces the argument that beyond formal contracts, mutual understanding of roles and norms is essential for construction quality.

Policy and practical implications

The results of this study underscore the critical role of relational factors, specifically communication, meetings, and reporting, in ensuring quality assurance in road construction projects. The client–consultant–contractor (3Cs) dynamic, when supported by effective communication systems and clearly defined roles, contributes significantly to the timely delivery and quality performance of road infrastructure. Drawing from the findings and grounded in agency theory, the following practical implications are proposed to enhance project outcomes in Tanzania’s construction sector.

First, establishing and institutionalising structured communication systems. Effective communication emerged as the strongest predictor of quality assurance. As such, construction stakeholders should institutionalise clear and consistent communication protocols. These include scheduled face-to-face meetings, email correspondence, and written minutes to ensure all parties are informed of project progress and challenges. A structured communication framework reduces misinterpretation, enhances transparency, and allows for timely decision-making.

Second, integrating digital tools for real-time collaboration. Given the growing use of platforms such as Zoom and chat rooms among DMDP stakeholders, it is recommended that digital tools be formally integrated into project management systems. These tools allow for real-time collaboration, especially when stakeholders are not physically available, and enhance responsiveness to emerging project issues. Their use should be supported by internal policies, training, and IT infrastructure.

Third, strengthening meeting and reporting frameworks for transparency. The study results also showed that meetings and reporting positively and significantly influence the quality assurance. Thus, project teams should adopt structured templates for reports, set regular intervals for meetings, and ensure all discussions are properly documented and shared. This improves accountability and ensures that project decisions are trackable and data-driven.

Fourth, promoting role clarity and inter-organisational coordination. Clarity in roles and responsibilities among the 3Cs contributes to effective collaboration and problem-solving. It is essential to conduct joint stakeholder sessions at project inception to define deliverables, reporting lines, and interdependencies. Furthermore, coordination with external agencies such as DAWASA and TANESCO should be formalised to mitigate delays and align all inputs with the project’s quality standards.

Conclusion

This study investigated the effects of the client–consultant–contractor relationship, focusing on communication, meetings, and reporting, on quality assurance in road construction projects under the Dar es Salaam Metropolitan Development Project. The findings reveal that effective communication and comprehensive reporting are critical drivers of quality assurance. Communication emerged as the



strongest predictor, highlighting the importance of timely, clear, and consistent information exchange among stakeholders to align project objectives and resolve issues promptly. Reporting, while less influential than communication, also plays a significant role in maintaining transparency and accountability throughout project implementation. The study underscores that a well-structured communication framework, complemented by regular meetings and systematic documentation, facilitates collaboration among clients, consultants, and contractors, thereby enhancing the overall quality of road construction projects. The use of digital communication platforms further supports real-time interaction, addressing logistical challenges and improving responsiveness. Ultimately, the client-consultant-contractor relationship, when managed effectively, contributes to delivering road infrastructure that meets required standards, reducing delays, and preventing cost overruns. This study advocates for institutionalising robust communication and reporting mechanisms, fostering stakeholder cooperation, and investing in capacity-building to sustain quality assurance practices. By highlighting these relational factors, the study offers valuable insights for policymakers, project managers, and practitioners aiming to improve road project outcomes in Tanzania and similar contexts. Future research could explore additional relational and technical factors influencing construction quality to build a more comprehensive understanding.

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