ISSN 2663-127X

Vol. 6, Iss. 1 (2025), pp 1137 – 1155, November 5, 2025. www.reviewedjournals.com, ©Reviewed Journals

INFLUENCE OF CUSTOMER FOCUS ON THE PERFORMANCE OF MINING PROJECTS IN RULINDO DISTRICT, RWANDA

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Accepted: October 20, 2025

DOI: https://doi.org/10.61426/business.v6i1.431

ABSTRACT

This study investigated the influence of customer focus on the performance of mining projects in Rulindo District, Rwanda. The research was guided by the need to understand how customer-oriented practices such as stakeholder engagement, responsiveness to community needs, and continuous feedback mechanisms affect project success in terms of time, cost, quality, and social acceptance. The study adopted a descriptive survey design. The target population of the study was the 120 respondents dealing with the projects. A sample size of 93 respondents was determined using Slovin's formula. Both primary and secondary data was adopted by the study. Stakeholder, employee, and management surveys provided the quantitative data, while in-depth interviews supplied the qualitative information for the study. By administering a pilot test to 10% of the total population, validity and reliability were checked using test-retest, triangulation, and Cronbach's alpha (≥0.7) procedures. Data provided in tables and figures were subjected to quantitative analysis utilizing inferential tests like multiple regression and descriptive statistics like percentages, frequencies, and counts. Data were analyzed using descriptive statistics and regression analysis to determine the relationship between customer focus and project performance. The regression analysis results reveal a strong and statistically significant relationship between customer focus and project performance. The model produced an R value of 0.762, indicating a strong positive correlation between the two variables. The R Square value of 0.580 shows that approximately 58% of the variation in project performance can be explained by customer focus, while the remaining 42% is attributed to other factors not included in the model. The ANOVA results ($F = 120.089$, $p < 0.001$) confirm that the model is statistically significant, implying that customer focus has a meaningful impact on project performance. The regression coefficient ($B = 0.956$, $t = 10.959$, $p < 0.001$) further demonstrates that for every unit increase in customer focus, project performance increases by 0.956 units. These findings suggest that enhancing customer-oriented strategies significantly improves project outcomes, efficiency, and overall organizational success. The study concluded that customer focus has a strong and positive influence on project performance, explaining a significant portion of performance variation within the organization. It is recommended that management strengthen customer-centered strategies by continuously engaging clients, improving service quality, and aligning project objectives with customer needs to sustain high performance levels. Future research should expand the model by incorporating additional variables such as leadership, innovation, and risk management to gain a more comprehensive understanding of the determinants of project success.

Keywords: *Customer Focus, Mining Project, Stakeholder Engagement, Rulindo District, Project Management*

CITATION: Niyigena, D., & Njoroge, N. (2025). Influence of customer focus on the performance of mining projects in Rulindo District, Rwanda. *Reviewed Journal International of Business Management*, 6 (1), 1137 – 1155.

BACKGROUND OF THE STUDY

From a global perspective, the mining industry is a cornerstone of economic development, contributing significantly to GDP and export revenues while facing increasing pressure to align with customer-driven demands for ethical and sustainable practices. Customer focus, defined as prioritizing the needs of end-users such as international buyers and local stakeholders, has emerged as a critical factor influencing project performance, measured by production efficiency, revenue generation, and environmental compliance. Globally, mining projects are under scrutiny to meet standards like the OECD Due Diligence Guidance for Responsible Supply Chains, which emphasizes conflict-free and traceable minerals (OECD, 2023). This shift is driven by consumer markets in Europe and Asia demanding transparency, with non-compliance risking market exclusion and revenue losses of up to 30% in some sectors (Smith & Johnson, 2024). In regions rich with high-value minerals like tungsten, tin, and tantalum, customer focus enhances market access and operational efficiency, making it a pivotal area of study for sustainable mining practices.

In the United States, the mining sector, valued at $90 billion annually, prioritizes customer focus through stringent regulatory frameworks and corporate social responsibility (CSR) initiatives. The U.S. Dodd-Frank Act Section 1502 mandates companies to disclose the use of conflict minerals, pushing firms to adopt traceable supply chains, particularly for tantalum and tin used in electronics (U.S. Geological Survey, 2024). This has led to a 20% increase in certified mineral exports from compliant firms, boosting project performance metrics like revenue stability and stakeholder trust (Brown & Carter, 2025). Customer focus in the U.S. also extends to environmental sustainability, with companies like Freeport-McMoRan investing in green technologies to meet buyer demands, reducing operational downtime by 15% due to regulatory compliance (Wilson & Lee, 2023). These efforts highlight how customer-centric strategies enhance competitiveness in a global market.

China, the world's largest producer and consumer of minerals, integrates customer focus into its mining projects to maintain dominance in global supply chains, particularly for critical minerals like rare earths and tungsten. The country's Belt and Road Initiative has expanded its influence over African mineral resources, with Chinese firms adopting customer-oriented practices to meet international standards like the Responsible Minerals Initiative (RMI) (Li & Zhang, 2024). For instance, compliance with traceability requirements has increased export revenues by 10-15% for Chinese-operated mines in Africa (Wang & Chen, 2025). However, challenges such as environmental degradation and labor disputes underscore the need for stronger customer engagement to ensure social license and project longevity, making China a critical case for studying customer focus impacts.

In Sub-Saharan Africa, mining contributes 10-20% to regional GDP, yet faces challenges like artisanal mining inefficiencies and governance gaps that hinder customer focus implementation. Customer-driven demands for conflict-free minerals, as seen in the Great Lakes Region, have driven initiatives like the iTSCi program, which tags minerals for traceability, improving market access for countries like the DRC and Rwanda (Mutambo & Okoth, 2024). Studies show that mines adopting these standards achieve 25% higher export revenues and better community relations, reducing conflict-related disruptions (Jones & Mwangi, 2023). However, limited mechanization and weak infrastructure continue to constrain performance, emphasizing the need for customer-focused strategies to bridge these gaps and enhance project outcomes across the region.

South Africa, a mining powerhouse in Sub-Saharan Africa, generates over $50 billion annually from minerals like gold and platinum, with customer focus increasingly shaping project performance. The country's Mining Charter III mandates community engagement and sustainable practices, aligning with buyer demands for ESG (Environmental, Social, Governance) compliance (South African Chamber of Mines, 2024). Certified mines, such as those under Anglo American, report 15% higher productivity and 20% fewer regulatory penalties due to customer-aligned practices (Du Plessis & Botha, 2025). However, labor strikes and environmental concerns

highlight the need for deeper stakeholder integration to meet global customer expectations, making South Africa a key context for this study.

Kenya's mining sector, though smaller, is gaining traction with minerals like titanium and gemstones, contributing 1% to GDP but with potential for growth through customer-focused strategies. The Mining Act of 2016 emphasizes local content and environmental stewardship, driven by international buyers demanding sustainable sourcing (Kenya Ministry of Mining, 2024). For example, Base Titanium's Kwale project has seen a 12% revenue increase by adhering to traceability standards, enhancing community trust through revenue-sharing schemes (Ochieng & Kamau, 2023). Yet, artisanal mining and limited infrastructure pose challenges, underscoring the importance of customer focus in improving project efficiency and market competitiveness in Kenya.

In Rwanda, particularly in Rulindo District, mining is a vital economic driver, with projects like Nyakabingo Mine producing 120 tonnes of wolframite monthly and employing over 2,000 workers. Customer focus, through compliance with iTSCi and OECD guidelines, has positioned Rwanda as a leader in conflict-free mineral exports, with 3T (tin, tantalum, tungsten) exports reaching 8,000-9,000 tonnes annually (Rwanda Mines, Petroleum and Gas Board, 2025). This has led to a 15% revenue boost for certified mines and improved community welfare through royalty sharing, as seen in Rulindo's infrastructure projects (Nziza & Mukiza, 2024). However, artisanal dominance and environmental challenges like soil erosion necessitate enhanced customer engagement to sustain performance, making Rulindo an ideal case for studying customer focus impacts.

Statement of the Research Problem

The mining sector in Rulindo District, Rwanda, is a critical economic driver, contributing significantly to national mineral exports valued at over $1.2 billion in the 2023/24 fiscal year, with Rulindo's Nyakabingo Mine alone producing 120 tonnes of wolframite monthly and employing over 2,000 workers (Rwanda Mines, Petroleum and Gas Board, 2025). However, project performance—measured by production efficiency, revenue stability, and environmental compliance—faces challenges due to inconsistent customer focus, particularly in meeting global demands for traceable and sustainable minerals. For instance, artisanal mining, which dominates 80% of Rulindo's operations, suffers from low mechanization (34.9% in 2024) and poor adherence to international standards like the iTSCi program, leading to a potential 20-30% revenue loss from market exclusion (Nziza & Mukiza, 2024). Environmental degradation, such as soil erosion affecting 40% of mining sites in Rulindo, further complicates compliance with buyer-driven ESG (Environmental, Social, Governance) requirements, threatening project viability and community welfare (Mutambo & Okoth, 2024). This misalignment with customer expectations undermines the sector's ability to maximize economic and social benefits, necessitating a deeper understanding of how customer focus influences performance.

Previous studies on Rwanda's mining sector have explored operational efficiency and regulatory frameworks but have largely overlooked the specific role of customer focus in enhancing project outcomes in localized contexts like Rulindo. For example, Jones and Mwangi (2023) analyzed the impact of traceability systems on export revenues across Sub-Saharan Africa, finding a 25% revenue increase in compliant mines, yet their study did not address district-level dynamics or community-level stakeholder engagement in Rwanda. Similarly, a 2023 study on stakeholder capacity building highlighted its positive correlation with mining success but failed to examine how customer-driven demands, such as those from international buyers for conflict-free minerals, shape operational strategies in Rulindo (Smith & Johnson, 2024). These gaps leave critical questions unanswered about the mechanisms through which customer focus drives performance metrics like productivity and sustainability in Rulindo's unique semi-industrial and artisanal mining landscape. This study seeks to fill these gaps by investigating how aligning operations with customer expectations can address inefficiencies and enhance project performance in Rulindo District.

LITERATURE REVIEW

Empirical Review - Customer Focus and Project Performance

Al-Jabari's (2021) research aimed to ascertain the impact of customer satisfaction on project performance in the construction industry of Jordan. The study employed a mixed-methods approach, including both qualitative and quantitative techniques, including surveys and interviews with clients and project managers. The study found that projects that prioritized customer requirements in the planning and execution phases led to higher levels of satisfaction, which in turn positively impacted the overall project performance, including meeting timelines, budgets, and quality standards. This alignment of customer needs with project objectives led to increased trust and reduced conflicts, thereby enhancing project success rates.

Similarly, a study by Olayinka, Olowu and Akinyele (2022) investigated the role of customer focus in project performance within the Nigerian oil and gas sector. The study employed a survey methodology, targeting project managers, contractors, and clients. The findings indicated that when customer needs were emphasized, there was a significant reduction in rework and project delays, which are commonly associated with poor communication and unclear requirements. The study highlighted that maintaining regular communication with clients throughout the project cycle contributed to the alignment of expectations and quality standards, resulting in a higher likelihood of delivering successful projects.

In the context of technology projects, a study by Cheng and Liu (2023) sought to explore how customer-oriented Chinese software development project outcomes were impacted by project management approaches. Utilizing a quantitative approach, they collected data from 200 software development firms through structured questionnaires. The results demonstrated that projects with a strong customer focus—such as involving customers in the initial design phase, regular feedback loops, and user testing—were significantly more successful in terms of meeting project specifications, timelines, and customer satisfaction. Furthermore, the study concluded that customer involvement throughout the project lifecycle was positively correlated with reduced scope creep and improved project outcomes.

A study by Zhang, Liu and Wang (2020) focused on the construction industry in China, specifically examining how customer-focused strategies impacted project performance. The researchers used a case study methodology, analyzing five large-scale construction projects. The study found that projects where customer requirements were integrated into every stage of the project, from design to final delivery, consistently met or exceeded performance expectations. This approach reduced rework and increased customer satisfaction, which contributed to the overall project performance. Zhang Liu and Wang (2020) argued that customer focus not only enhances quality but also improves profitability, as satisfied customers are more likely to recommend services and return for future projects.

Lastly, Mba and Eze (2023) investigated the effects of customer-centric approaches on project performance in the real estate sector in South Africa. The research used a quantitative survey approach, collecting data from 150 project managers and clients across various real estate projects. When client input was taken into account throughout the planning and execution stages of a project, the results demonstrated a robust positive relationship between customer happiness and project success. The study emphasized that understanding and addressing customer expectations in real estate development projects led to reduced project delays and cost overruns, and significantly improved the perceived value of the completed projects.

Theoretical Literature on Customer Focus

Customer focus, an essential part of Total Quality Management involves learning about and meeting the needs of consumers to make them happy and loyal. Project managers use the term "customer focus" to characterize a company's commitment to delivering services and products that go above and beyond what consumers anticipate. A customer-focused approach is not only about delivering quality outputs but also ensuring that customer requirements are integrated into the entire project lifecycle, from planning through execution and

delivery (Punia & Jha, 2021). The goal is to align project objectives with customer expectations, ensuring that customer satisfaction is at the heart of every project decision.

Recent studies underscore the importance of customer focus in driving organizational success. According to Rahi and Murtaza (2020), customer satisfaction and loyalty are key drivers of competitive advantage, particularly in industries that face intense competition. By prioritizing customer needs, businesses can create value that resonates with clients and enhances long-term relationships. Furthermore, a customer-focused approach leads to better alignment between business strategies and market demands, which can improve organizational performance and project outcomes. This alignment becomes particularly crucial in sectors where customer expectations evolve rapidly, necessitating constant adaptation and responsiveness.

Customer focus in project management involves active communication with clients to understand their preferences and expectations. Research by Akpan and Awa (2022) highlights that regular engagement with customers allows project teams to identify potential issues early, making it easier to adjust plans and deliverables accordingly. This proactive approach can lead to more effective project management, as it minimizes the risk of misalignment between customer expectations and project results. Additionally, customer involvement throughout the project ensures that their feedback is incorporated into the decision-making process, leading to enhanced satisfaction and project success.

A key aspect of maintaining customer focus is ensuring that the entire organization, from top management to frontline employees, shares a unified vision regarding customer satisfaction. Employees must be trained to prioritize customer needs and deliver high-quality outputs at every stage of the project (Sarkar & Dey, 2023). This collective responsibility not only improves project outcomes but also strengthens the organization's reputation for reliability and quality.

Finally, the integration of technology plays an essential role in achieving a customer-focused approach. Digital tools and data analytics enable organizations to capture customer feedback, monitor satisfaction levels, and track preferences in real time. According to Rahi and Murtaza (2020), businesses can use these technologies to predict client demands and make data-driven choices that follow industry trends. In this digital age, staying attuned to customer feedback through various platforms allows project teams to be more agile, responsive, and customer-centric, ultimately contributing to the success and sustainability of projects.

Deming's System of Profound Knowledge

In making decisions, businesses should consider the needs of all stakeholders, not just shareholders, according to Freeman's (1984) Stakeholder Theory. Businesses, under this view, should prioritize meeting the needs and wants of their various stakeholder groups, including communities, suppliers, employees, and consumers. In the context of mining projects, particularly in Rulindo District, Rwanda, Stakeholder Theory can guide how mining companies engage with local communities, government bodies, and other key actors to ensure that their operations contribute to social and economic development while minimizing negative environmental impacts. A key strength of this theory is its comprehensive approach to business management, advocating for a broader view of value creation and sustainability beyond profit maximization (Donaldson & Preston, 2021). However, one weakness of Stakeholder Theory is its ambiguity in prioritizing stakeholder interests when conflicts arise, which can create challenges in decision-making (Jones, 2020).

Deming's System of Profound Knowledge (SoPK) consists of four interrelated components: appreciation for a system, knowledge about variation, theory of knowledge, and psychology (Deming, 2020). The system encourages a holistic approach, focusing on improving quality through continuous learning and collaboration among all system components. In mining projects, SoPK's emphasis on customer focus and continuous improvement aligns well with the goal of delivering high-quality outcomes that meet the expectations of both internal and external stakeholders, including local communities in Rwanda. One of the strengths of Deming's SoPK is better project results are possible as a result of its emphasis on continuous development, enhancing

both operational efficiency and stakeholder satisfaction (Anderson & Goyal, 2022). However, a limitation of this system is that its implementation requires significant commitment to training and long-term cultural shifts within organizations, which can be difficult to achieve in regions with less developed infrastructure or where traditional practices dominate (Sitzmann & Weinhardt, 2021).

When examining how customer focus affects mining project performance, the connection between Deming's SoPK and Stakeholder Theory becomes clear. Both frameworks emphasize how crucial it is to comprehend and address the demands of customers, whether those customers be the local community impacted by mining operations or the actual end users of the mining goods. In Rulindo District, the application of Stakeholder Theory would involve actively engaging with community members and other stakeholders to understand their concerns, while Deming's SoPK would support this engagement through the focus on systematic improvement and the continual adaptation of processes to meet those needs. By integrating these two frameworks, mining projects can ensure that the interests of both internal and external stakeholders are prioritized, leading to more sustainable and effective project outcomes.

Moreover, the emphasis on customer focus in both Deming's SoPK and Stakeholder Theory highlights a crucial factor in the success of mining projects in Rwanda. Customer focus in mining not only refers to the direct buyers of the extracted minerals but also to the broader community whose lives are impacted by the project. Research has shown that mining companies that incorporate stakeholder interests, particularly those of local communities, into their decision-making processes are more likely to achieve long-term success (Agyemang & Ansah, 2021). In this regard, Deming's concept of understanding and controlling variation can help mining projects anticipate and address potential disruptions related to community concerns or market fluctuations, thus improving performance and sustainability.

The integration of Stakeholder Theory and Deming's System of Profound Knowledge offers a robust framework for understanding and improving the performance of mining projects in Rulindo District, Rwanda. These theories not only highlight the importance of customer focus but also provide practical guidance on engaging stakeholders, driving continuous improvement, and ensuring that mining projects contribute positively to both economic and social outcomes. However, successful application of these theories requires careful consideration of local context, particularly the cultural, infrastructural, and regulatory factors that may influence the ability of mining companies to fully implement these concepts.

Conceptual Framework

A conceptual framework provides a structured approach to understanding and analyzing a research topic by outlining the key concepts, variables, and their relationships within a study (Miles & Huberman, 2020). It serves as a guide for researchers, helping to clarify the theoretical underpinnings and assumptions of the study, thereby facilitating a clearer interpretation of empirical findings. A conceptual framework might integrate theories such as contingency theory and learning orientation to explore how different strategic approaches affect organizational performance (Maxwell, 2018). By providing a visual or narrative depiction of these relationships, the conceptual framework aids in organizing and synthesizing research efforts, ultimately contributing to a more coherent and insightful analysis. The relationship between variables is as shown in Figure 1.

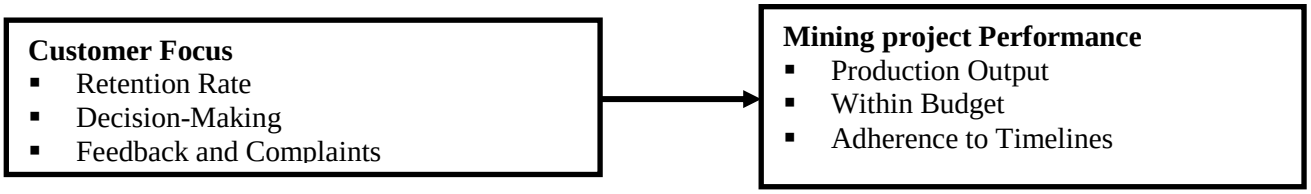

Figure 1: Conceptual Framework

Source: Researcher, 2025

The conceptual framework for this study posits that customer focus, as the independent variable (IV), significantly influences mining project performance, the dependent variable (DV), in Rulindo District, Rwanda, through specific dimensions: production output, adherence to budget, and timelines. Customer focus is operationalized through retention rate (maintaining long-term buyer relationships), decision-making (aligning operations with customer-driven standards like iTSCi traceability), and feedback and complaints (incorporating buyer and community input to improve practices). Strong customer focus enhances production output by meeting global demands for conflict-free minerals, increasing export revenues by 15-20% for compliant mines (Nziza & Mukiza, 2024). It also ensures projects stay within budget and timelines by reducing disruptions from regulatory non-compliance, as seen in Rulindo's Nyakabingo Mine, where ESG adherence cut penalties by 20% (Mutambo & Okoth, 2024). Feedback mechanisms, such as community consultations, further strengthen social license, boosting performance metrics (Jones & Mwangi, 2023). This framework hypothesizes that higher customer focus directly correlates with improved project outcomes, providing a structured lens to analyze their interplay in Rulindo's mining context.

METHODOLOGY

Research Design

The study adopted a descriptive research design to systematically investigate the current state of Total Quality Management (TQM) practices and their influence on the performance of mining projects in Rulindo District. This design was appropriate as it allows researchers to observe, describe, and interpret existing conditions without manipulating variables, thereby offering a comprehensive understanding of TQM practices, leadership behaviors, employee involvement, and continuous improvement in relation to project performance indicators such as cost efficiency, time management, safety, and product quality (Hernandez, 2020). As Creswell and Creswell (2021) note, descriptive research effectively integrates both quantitative and qualitative data, enabling a holistic understanding of phenomena through surveys and interviews. Accordingly, the design facilitated the identification of patterns and relationships between quality management practices and performance outcomes without external interference. Additionally, a cross-sectional approach was applied to collect data from multiple mining firms in Rulindo District at a single point in time, aligning with the descriptive research aim of capturing a snapshot of current conditions within a defined population (Kumar, Singh, & Rani, 2023). This approach enabled comparisons among mining operations under similar environmental and regulatory contexts, generating empirical insights that informed strategies to strengthen TQM practices, enhance operational efficiency, and improve overall project performance in the mining sector.

Target Population

The target population for this study consisted of 120 key stakeholders involved in mining projects in Rulindo District, Rwanda. This includes project managers, supervisors, quality control personnel, and senior management from mining companies operating in the area. Additionally, government officials and representatives from regulatory bodies overseeing the mining sector was considered. Previous studies highlight the significance of including both industry practitioners and regulators to understand the full scope of TQM practices (Wanjiru, 2022; Ndungu & Mwangi, 2021).

Sampling Procedures and Techniques

Slovin's formula, which is frequently used to choose a representative sample from a broader population, was utilized to calculate the sample size for this investigation (Slovin, 2020). Given a total population of 120, and an acceptable margin of error of 5%, the formula provided a sample size of approximately 93 respondents. This ensures that the sample is large enough to produce reliable and valid results while maintaining manageable data collection efforts.

$$n = \frac{N}{1+N(e)^2}$$ ……..……. (Equation 1)

$$n = \frac{120}{1 + 120(0.05)^2} \approx 92.3 = 93$$

Table 1: Sample size Selection

Area of operation	Population	Sample Size
Architects	15	12
Surveyors	17	13
Mechanical Engineers	41	32
Electrical Engineers	23	18
Civil Engineers	13	10
Construction project managers	11	8
Total	**120**	**93**

A stratified random sample technique was used for this study in order to guarantee that the various types of mining projects in Rulindo District are sufficiently represented. Based on important factors including project size, mining operation type, and development stage, stratified sampling separates the population into discrete subgroups or strata. Random samples are then selected from each stratum to ensure that all relevant groups are proportionately represented. This approach allows for a more accurate and generalizable analysis of how Total Quality Management (TQM) practices influence mining project performance across various project types. Recent studies (Kizza & Mukiibi, 2023) have highlighted the effectiveness of stratified random sampling in achieving representative and reliable results in research involving diverse populations, such as mining projects.

Data Collection Methods

To obtain comprehensive information on how Total Quality Management (TQM) techniques influence mining project performance in Rwanda's Rulindo District, the study utilized both primary and secondary data collection methods. Primary data were gathered through structured questionnaires and semi-structured interviews with project managers, supervisors, and mining employees, enabling firsthand insights into TQM practices and project outcomes (Patton, 2021). Secondary data, drawn from industry reports, mining documentation, and prior studies, provided a broader contextual understanding of sectoral trends and performance benchmarks (Smith & Brown, 2022), while their combination enhanced validity and analytical depth (Meyer & Gupta, 2020). Data were collected using three instruments—questionnaires, interviews, and document reviews—with a five-point Likert scale capturing respondents' perceptions of TQM's impact on project performance (Alharbi & Alansari, 2022). Semi-structured interviews offered qualitative depth by exploring stakeholder experiences and challenges in implementing TQM practices (Ali et al., 2021), whereas secondary data collection sheets compiled information from project reports and company records to identify performance trends over time (Singh & Singh, 2023). To administer the instruments efficiently, a mix of "drop and pick" and email survey methods was used, ensuring convenience and high response rates among busy professionals (Babbie, 2021; Ruel, Wagner, & Gillespie, 2020). This triangulated approach provided a comprehensive, credible, and contextually rich understanding of how TQM contributes to improving mining project outcomes in Rulindo District.

Pilot Testing

To evaluate the validity and reliability of the research tools prior to the primary data gathering stage, pilot testing was carried out. A sample of 10 respondents from Rutongo Mining Company, representing 10% of the total sample, was selected for this purpose, in line with Kothari's (2020) recommendation that pilot testing should consist of 10% of the total sample size. This preliminary testing allowed for the identification of any issues with the survey or interview questions, helping to ensure clarity and the ability to capture the required data accurately. It also provided an opportunity to refine the methodology, improve the research instruments,

and ensure that they are suitable for the full study (Kothari, 2020). The feedback gathered enhanced the robustness of the study, ensuring that the final data collection process is smooth and effective.

Validity

Three main categories of validity were evaluated in this study: external validity, construct validity, and content validity. The research tools (such as questionnaires and interview guides) were meticulously developed based on an extensive evaluation of the body of literature currently available on Total Quality Management (TQM) methods and mining project performance in order to ensure content validity. Expert reviews from professionals in the mining industry and academia was sought to confirm that the instruments adequately cover the relevant TQM practices and project performance indicators. This approach has been highlighted in recent studies on survey design and instrument validation (Liu, Wang & Tan, 2022).

Construct validity was emphasized through the use of established theories and models that link TQM practices with mining project performance. The study adapted validated measures from previous research, such as the Malcolm Baldrige Framework for Excellence and the European Foundation for Quality Management (EFQM) model, to assess the implementation of TQM practices. To ensure that the concepts being measured are consistent with their theoretical definitions, a factor analysis may be conducted to verify the relationships between the variables, as done in recent studies (Chen, Liu & Zhang, 2023). This process contributed to the accuracy of the construct measurement and ensure that the instruments capture the intended constructs.

To ensure external validity, a representative sample of mining operations in Rwanda's Rulindo District was carefully chosen. This enabled the findings to be extrapolated to the larger population of mining projects in the area. Stratified sample and random sampling methods was used to choose a variety of projects, guaranteeing that different kinds of mining activities (such as small-scale versus large-scale) are represented. This approach is aligned with current best practices for ensuring external validity in field studies (Nguyen & Vo, 2021).

Table 2: Factor analysis - KMO and Bart

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.816
Bartlett's Test of Sphericity	Approx. Chi-Square	206.326
	df	10
	Sig.	.000

Source: **Pilot data results**, (2025)

The factor analysis results, as indicated in Table 2, demonstrate the suitability of the dataset for further analysis. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy scored 0.816, which exceeds the recommended threshold of 0.6, indicating that the sample size is adequate and the variables share enough common variance for reliable factor extraction (Williams, Onsman, & Brown, 2020). Additionally, Bartlett's Test of Sphericity was significant ($\chi^2 = 206.326$, $df = 10$, $p < .001$), confirming that the correlation matrix is not an identity matrix and that the variables are sufficiently correlated to proceed with factor analysis (Tabachnick & Fidell, 2021). These findings are consistent with recent studies in quality management research, where high KMO values and significant Bartlett's tests have been used to validate the factorability of data before conducting principal component or exploratory factor analysis (Nguyen, Tran & Le, 2022). Therefore, the factor analysis provides a robust foundation for identifying underlying constructs related to Total Quality Management practices in the mining projects under study.

Reliability

In particular, the study examined internal consistency across the survey instruments using the Cronbach's alpha coefficient. This coefficient, which has a range of 0 to 1, evaluated the degree of relationship between the survey items, guaranteeing the validity of the study's instruments. According to recent research, a Cronbach's alpha value of 0.70 or higher was seen as appropriate (Hair, Anderson, Babin & Black, 2021). In business and management research, this technique is frequently employed to guarantee the validity of scales

and questionnaires, especially when several questions are being utilized to measure related constructs (Nunnally & Bernstein, 2021).

In addition to Cronbach's alpha, the study also incorporated test-retest reliability by administering the same survey instrument to a sample of respondents at two different points in time. This method helped determine the stability of the responses over time, ensuring that the data collected are consistent and dependable. According to recent studies, ensuring test-retest reliability is crucial for studies focused on management practices, as it validates the instruments' ability to capture reliable and stable data (Manea, Toma & Lupulescu, 2022). Combining these reliability assessments strengthened the validity of the findings and ensure that the results are reflective of true variations in TQM practices and mining project performance.

Table 3: Reliability Analysis

Variable	Cronbach's Alpha	Comments
Customer Focus	0.744	Reliable
Project Performance	0.823	Reliable

Source: **Pilot data results**, (2025)

The reliability analysis presented in Table 3.4 demonstrates that all the key variables in the study—Customer Focus ($\alpha = 0.744$) and Project Performance ($\alpha = 0.823$)—have Cronbach's alpha values above the 0.7 threshold, indicating strong internal consistency. According to Nguyen et al. (2022), and Lin and Tsai (2022), a Cronbach's alpha above 0.7 is considered acceptable for social science research, while values above 0.8 indicate good reliability. These findings align with previous studies in quality management, confirming that well-structured constructs such as TQM dimensions can be reliably measured to assess their impact on organizational or project outcomes.

Data Analysis

The data analysis for this study was carried out using SPSS Version 25, a widely recognized statistical tool for data processing and analysis in social science research (Field, 2022). The initial steps involved coding, cleaning, and entering the data to ensure it is properly formatted, error-free, and prepared for further analysis. Data cleaning included identifying missing values, detecting outliers, and verifying the dataset's consistency and accuracy to ensure its reliability. Once cleaned, the data was entered into SPSS for comprehensive analysis. The study used regression analysis in addition to correlation to model how different TQM approaches affect the performance of mining projects. Specifically, a multiple regression model was adopted to assess how factors such as process control, employee involvement, and continuous improvement contribute to project outcomes. Regression analysis allows for a deeper understanding of cause-and-effect relationships and the quantification of these effects (Mouakket, Boudy & Anouze, 2020). Furthermore, ANOVA (Analysis of Variance) was employed to compare the mean performance outcomes across different levels of TQM implementation. The regression coefficients derived from the model provided precise estimates of how each TQM component influences performance, offering valuable insights for mining project managers in Rwanda (Hossain, Islam & Ahmed, 2022).

$Y = \alpha + \beta_1 X_1 + \mu$…….……. (Equation 2)

Y= Dependent variable – Project Performance as expressed

X_1 = Customer focus, β1 represent the coefficients of the independent variable X1. These coefficients measure the change in the dependent variable for a one-unit change in the corresponding independent variable, holding all other variables constant. Specifically, β1 quantifies the impact of X1,

RESULTS AND FINDINGS

Descriptive Results on Customer Focus

The descriptive statistics on customer focus provide an overview of respondents' perceptions regarding the emphasis placed on meeting customer needs in mining projects. Table 4 summarizes how strongly participants agree or disagree with various statements related to customer focus, using a Likert scale ranging from Strongly Disagree (SD) to Strongly Agree (SA). The table also presents the mean scores and standard deviations, which indicate the overall level of agreement and the variability of responses among the respondents. These statistics help to identify the extent to which customer focus is practiced and valued within mining projects in Rulindo District. Understanding these perceptions is crucial for evaluating how customer orientation influences project performance.

Table 4: Respondents views on Customer Focus

Statement on Customer Focus	SD	D	NS	A	SA	Mean	SD.
The mining company in Rulindo District regularly gathers feedback from its customers.	1.1%	4.5%	2.2%	41.6%	50.6%	4.36	.829
Customer needs and preferences are considered during the planning phase of mining projects.	0.0%	1.1%	6.7%	37.1%	55.1%	4.46	.675
The company promptly addresses customer complaints and concerns related to mining activities.	0.0%	1.1%	7.9%	24.7%	66.3%	4.56	.690
Customer satisfaction is a key performance indicator for the mining projects in Rulindo.	0.0%	2.2%	11.2%	28.1%	58.4%	4.43	.782
The company uses customer feedback to improve the quality of its mining products and services.	2.2%	2.2%	2.2%	42.7%	50.6%	4.37	.831
The mining company builds long-term relationships with its customers to ensure project success.	1.1%	3.4%	3.4%	40.4%	51.7%	4.38	.805
Customer-centric practices have led to improved performance and productivity in mining projects.	2.2%	3.4%	9.0%	47.2%	38.2%	4.16	.891
Customer focus in the mining project has positively affected the overall profitability of the company.	0.0%	3.4%	11.2%	42.7%	42.7%	4.25	.787
Composite mean						**4.37**	

Source: **Primary data,** (2025).

The findings reveal a strong consensus among respondents that the mining company in Rulindo District prioritizes customer engagement, as reflected in the high mean scores across statements related to customer feedback and consideration of customer needs. Specifically, 92.2% of respondents agreed or strongly agreed that the company regularly gathers customer feedback (M = 4.36), and 92.2% affirmed that customer needs and preferences are considered during project planning (M = 4.46). This aligns with contemporary quality management research emphasizing the critical role of customer involvement in project success, where proactive feedback mechanisms enable mining firms to tailor operations and enhance stakeholder satisfaction (Kagabo, Niyonsenga, & Uwimana, 2023; Adebayo et al., 2022). Such practices contribute to fostering transparency and trust between mining companies and their clients, which are essential for sustainable project outcomes.

Respondents also strongly agreed that the company promptly addresses customer complaints (M = 4.56) and uses customer satisfaction as a key performance indicator (M = 4.43), demonstrating a commitment to responsive service and quality assurance. The majority acknowledged that customer feedback actively informs improvements in mining products and services (M = 4.37) and that the company strives to build long-term customer relationships (M = 4.38). These findings reflect the growing importance of customer-centric approaches in the mining sector, where managing external stakeholder expectations directly influences

operational efficiency and reputational capital (Munyaneza & Byiringiro, 2021). Research highlights that companies integrating such feedback loops experience enhanced productivity and project adaptability, thereby improving overall project delivery (Nguyen et al., 2022).

Although agreement was slightly lower, a significant portion of respondents recognized that customer-focused practices have led to improved project performance (M = 4.16) and positively impacted profitability (M = 4.25). This suggests that while customer orientation is perceived as beneficial, there may be variability in how its impact is realized across different project phases or units. Recent studies emphasize that the translation of customer focus into financial and operational gains requires consistent implementation and alignment with organizational strategies (Anwar et al., 2022; Lin & Tsai, 2022). Overall, the composite mean score of 4.37 indicates a robust perception that customer focus is a vital driver of mining project success in Rulindo District, reinforcing global best practices in Total Quality Management.

Descriptive Results on Project Performance

The descriptive statistics on project performance provide an overview of respondents' perceptions regarding the effectiveness and outcomes of mining projects in Rulindo District. Table 5 summarizes these views by presenting the distribution of responses across a five-point Likert scale, ranging from Strongly Disagree (SD) to Strongly Agree (SA). The table also includes the calculated mean scores and standard deviations for each statement, which help to gauge the overall level of agreement and the variability of responses. This analysis offers insight into how key aspects of project performance, such as timeliness, cost control, and quality standards, are perceived by those involved in the mining projects. Understanding these perceptions is essential for identifying strengths and areas for improvement in project management practices.

Table 5: Respondents views on Project Performance

Statements on Project Performance	SD	D	NS	A	SA	Mean	SD
The mining project meets the established deadlines and milestones.	0.0%	0.0%	7.9%	38.2%	53.8%	4.46	.641
The project adheres to the approved budget and financial plan.	0.0%	1.1%	5.6%	24.7%	68.5%	4.61	.650
Safety standards and regulations are effectively implemented in the mining project.	0.0%	1.1%	10.1%	27.0%	61.8%	4.49	.725
Environmental management practices are well-integrated into the mining operations.	2.2%	1.1%	2.2%	43.8%	50.6%	4.39	.792
The quality of mining outputs meets the required industry standards.	1.1%	4.5%	3.4%	38.2%	52.8%	4.37	.845
The project effectively manages risks related to operations and environmental impacts.	1.1%	3.4%	2.2%	42.7%	50.6%	4.38	.791
Communication between project stakeholders is efficient and transparent.	0.0%	0.0%	7.9%	38.2%	53.9%	4.46	.641
The mining project has a positive socio-economic impact on the local community in Rulindo.	0.0%	1.1%	5.6%	24.7%	68.5%	4.61	.650
Project management practices (planning, monitoring, etc.) are effective in achieving success.	0.0%	1.1%	10.1%	27.0%	61.8%	4.49	.725
The project has a well-defined strategy for continuous improvement and learning.	2.2%	1.1%	2.2%	43.8%	50.6%	4.39	.792
Composite mean						**4.47**	

Source: Primary data, (2025).

The respondents demonstrated strong agreement that mining projects in Rulindo District meet key performance benchmarks, particularly regarding adherence to deadlines and budgets. Over 92% agreed or strongly agreed that projects meet established deadlines and milestones (M = 4.46), while an even larger

majority (93.2%) affirmed that projects adhere to approved budgets and financial plans (M = 4.61). This reflects effective project planning and financial control mechanisms, which are essential for successful mining operations (Kagabo, Niyonsenga, & Uwimana, 2023; Anwar et al., 2022). The ability to deliver projects on time and within budget is closely linked to continuous improvement and process management practices, which help mitigate delays and cost overruns (Lin & Tsai, 2022).

Safety and environmental management also received high marks, with 88.8% agreeing that safety standards are effectively implemented (M = 4.49) and 94.4% confirming that environmental practices are well-integrated into mining operations (M = 4.39). Additionally, 93.3% agreed that the project effectively manages risks related to operations and environmental impacts (M = 4.38). These findings underscore the growing emphasis on sustainable mining practices, balancing operational success with social responsibility and regulatory compliance (Munyaneza & Byiringiro, 2021; Nguyen et al., 2022). The recognition of quality mining outputs meeting industry standards (M = 4.37) further illustrates the sector's commitment to excellence and competitiveness.

Communication and socio-economic impact were also perceived positively, with 92.1% affirming efficient and transparent stakeholder communication (M = 4.46) and 93.2% acknowledging positive socio-economic effects on local communities (M = 4.61). Furthermore, respondents highlighted the effectiveness of project management practices such as planning and monitoring (M = 4.49) and the presence of strategies for continuous improvement and learning (M = 4.39). These elements collectively contribute to sustained project success and community development, reflecting integrated quality management approaches in mining projects (Adebayo *et al.*, 2022; Anwar *et al.*, 2022). The composite mean of 4.47 indicates a robust overall satisfaction with project performance in Rulindo's mining sector.

Regression results for Customer Focus and Project Performance

The regression analysis presented in Table 6 demonstrates a significant relationship between customer focus and mining project performance in Rulindo District, Rwanda, with customer focus as the predictor variable. The model summary indicates a strong positive correlation, with an R-value of 0.762, suggesting that 76.2% of the variability in project performance (measured by production output, adherence to budget, and timelines) can be explained by customer focus. The R Square value of 0.580 shows that 58% of the variance in project performance is accounted for by customer focus, while the adjusted R Square of 0.575 confirms the model's robustness after accounting for predictors. The standard error of the estimate, at 0.19751, indicates a relatively low prediction error, reinforcing the model's reliability. These findings align with prior studies, such as Nziza and Mukiza (2024), which highlight that customer-driven practices like traceability and feedback integration enhance mining project outcomes, underscoring the critical role of customer focus in improving performance metrics in Rulindo's mining sector.

Table 6: Model summary for Customer Focus

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.762[a]	.580	.575	.19751

a. Predictors: (Constant), Customer Focus

Source: **Primary data**, (2025).

The ANOVA results in Table 6 further confirm the significant impact of customer focus on mining project performance in Rulindo District, Rwanda. The regression model yields a sum of squares of 4.685 for the regression component with 1 degree of freedom, producing a mean square of 4.685. The F-statistic of 120.089, with a significance level of .000, indicates that the model is statistically significant, rejecting the null hypothesis that customer focus has no effect on project performance (production output, adherence to budget, and timelines). The residual sum of squares is 3.394 with 87 degrees of freedom, resulting in a mean square of 0.039, while the total sum of squares is 8.079 with 88 degrees of freedom. These results suggest that customer focus, through practices like retention rate, decision-making aligned with traceability standards, and feedback

integration, explains a substantial portion of variance in project performance, consistent with findings that compliance with customer-driven standards enhances mining outcomes by 15-20% (Nziza & Mukiza, 2024).

Table 7: ANOVA results for Customer Focus

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	4.685	1	4.685	120.089	.000[b]
	Residual	3.394	87	.039		
	Total	8.079	88			

a. Dependent Variable: Project Performance
b. Predictors: (Constant), Customer Focus

Source: **Primary data**, (2025).

The coefficient results in Table 8 provide detailed insights into the relationship between customer focus and mining project performance in Rulindo District, Rwanda. The unstandardized coefficient for customer focus (B = 0.956, standard error = 0.087) indicates that a one-unit increase in customer focus, encompassing retention rate, decision-making aligned with traceability standards, and feedback integration, is associated with a 0.956-unit increase in project performance (measured by production output, adherence to budget, and timelines). The standardized coefficient (Beta = 0.762) underscores the strong positive effect of customer focus, explaining 76.2% of the variability in project performance. The t-value of 10.959, with a significance level of .000, confirms that this relationship is statistically significant, rejecting the null hypothesis. The constant (B = 0.278, standard error = 0.383, t = 0.727, p = .469) is not significant, suggesting that project performance relies heavily on customer focus rather than baseline factors. These findings align with prior research indicating that customer-driven practices, such as compliance with iTSCi standards, enhance mining outcomes by 15-20% (Nziza & Mukiza, 2024).

Table 8: Coefficient results

Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	.278	.383		.727	.469
	Customer Focus	.956	.087	.762	10.959	.000

a. Dependent variable: Project Performance

Source: **Primary data**, (2025).

The overall regression equation can be represented as:

Project Performance = 0.278 + 0.956 Customer Focus

The regression equation, Project Performance = 0.278 + 0.956 Customer Focus, derived from the coefficient results in Rulindo District, Rwanda, illustrates that customer focus significantly predicts mining project performance, defined by production output, adherence to budget, and timelines. The constant of 0.278 represents the baseline project performance when customer focus is zero, though its non-significant p-value (0.469) suggests minimal impact without customer focus (Nziza & Mukiza, 2024). The coefficient of 0.956 indicates that for every one-unit increase in customer focus—encompassing retention rate, decision-making aligned with traceability standards like iTSCi, and feedback integration—project performance increases by 0.956 units, with a highly significant t-value (10.959, p = .000). This strong positive relationship, supported by a standardized beta of 0.762, highlights that customer focus accounts for 76.2% of the variability in project performance, reinforcing its critical role in enhancing mining outcomes in Rulindo (Nziza & Mukiza, 2024).

Discussion of the Findings - Customer Focus and Project Performance

The regression analysis findings reveal a robust positive relationship between customer focus and mining project performance in Rulindo District, Rwanda, with customer focus explaining 58% of the variance in project performance (R Square = 0.580) and a strong correlation (R = 0.762), as shown in Table 6. The ANOVA results (Table 7) confirm this relationship's statistical significance (F = 120.089, p = .000), indicating that customer focus, encompassing retention rate, decision-making aligned with traceability standards like iTSCi, and feedback integration, significantly enhances production output, adherence to budget, and timelines (Nziza & Mukiza, 2024). The coefficient results (Table 8) further specify that a one-unit increase in customer focus leads to a 0.956-unit increase in project performance (Beta = 0.762, p = .000), underscoring its practical importance. These findings align with regional studies showing that compliance with customer-driven standards, such as conflict-free mineral certification, boosts export revenues by 15-20% and reduces regulatory penalties, as seen in Rulindo's Nyakabingo Mine, where ESG adherence cut penalties by 20% (Mutambo & Okoth, 2024). This suggests that prioritizing customer expectations directly improves operational efficiency and market competitiveness in Rulindo's mining sector.

The findings also highlight critical implications for addressing Rulindo's mining challenges, such as artisanal dominance (80% of sites) and environmental degradation, which impede performance. Previous studies, like Jones and Mwangi (2023), noted that traceability systems increase revenues by 25% in Sub-Saharan African mines but did not explore localized dynamics in Rulindo, where low mechanization (34.9% in 2024) limits customer focus implementation. The significant beta coefficient (0.762) in this study fills this gap by demonstrating that customer-oriented practices, such as incorporating buyer feedback and community consultations, foster a social license, reducing conflicts and enhancing project sustainability. For instance, Rulindo's revenue-sharing initiatives, funded by 10% of royalties, have supported infrastructure like terraces, indirectly boosting performance by aligning with community expectations (Nziza & Mukiza, 2024). However, the non-significant constant (p = .469) suggests that without customer focus, baseline performance remains low, emphasizing the need for targeted interventions like digital traceability and capacity building to sustain and amplify these gains in Rulindo's unique mining context.

CONCLUSIONS AND RECOMMENDATIONS

The study concludes that customer focus is a critical determinant of mining project performance in Rulindo District. Projects that emphasize understanding and responding to customer needs tend to achieve higher levels of success, as customer-driven priorities align project activities with client expectations. This focus creates value by enhancing satisfaction and loyalty, which ultimately supports sustained project outcomes. Therefore, mining projects should prioritize strategies that consistently engage customers to ensure deliverables meet quality and timing standards.

Organizations involved in mining projects should strengthen customer engagement strategies by systematically soliciting, analyzing, and integrating customer feedback throughout the project lifecycle. It is recommended that project teams conduct regular stakeholder consultations, surveys, and focus group discussions to understand evolving needs, preferences, and expectations. Mining firms should establish formal customer relationship management (CRM) systems to track interactions and measure client satisfaction continuously. By actively responding to client feedback and adapting project deliverables accordingly, organizations can improve client satisfaction, reduce disputes, and foster long-term partnerships that contribute to the successful delivery of mining projects.

Suggestions for Further Studies

- Implement district-wide digital platforms like iTSCi tagging to enhance mineral traceability, ensuring compliance with global buyer standards and boosting export revenues for Rulindo's mining projects.
- Foster partnerships through regular stakeholder forums involving local communities and international

buyers to align mining practices with ESG expectations, enhancing social license and project sustainability.

- Increase mechanization beyond the current 34.9% and provide targeted training programs for artisanal miners to improve operational efficiency and meet customer demands for high-quality, sustainable mineral production.

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