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# Examining Effectiveness of Project Cost Control Mechanism in Enhancing Project Performance: A Case Study of the Lusaka City Road Rehabilitation Construction Projects

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**Abstract**

The main objective of the study is to examine effectiveness of project cost control mechanism in enhancing project performance. This is a case study of the Lusaka city road rehabilitation construction projects. Specific Objectives were; To establish types of budgetary cost control mechanisms employed in projects; To examine effectiveness of budgetary cost control mechanisms employed in projects; To evaluate relationship between project cost mechanisms and completion and to ascertain limitations in budgetary cost control mechanisms employed in projects. This is case study design. The study used primary data which was collected through questionnaire and interview to get perception on causes of time overrun. The data collected was analyzed using both descriptive l methods. Information obtained from interviews was used to reinforce the implication of the questionnaire result. For this study, the population consisted of all the key employees from road construction companies in Lusaka. This study covered the project execution department. The project execution department is responsible for the execution of all the projects in the province, that is, the creation of new assets and the maintenance of the existing ones. The participants in this study were therefore the various employees from the project execution department, as well as the departments that work hand in hand with the project execution department. The participants had diverse knowledge and experience in working with projects. The ANOVA table shows that the model is highly significant ($F = 71.474$, $p < .000$), indicating that the predictors collectively explain a substantial portion of the variance in effectiveness ratings. Among the predictors, budget deviation (%) has the strongest impact, with a significant negative coefficient ($\beta = -.695$, $p < .000$), indicating that higher budget deviations are associated with lower effectiveness ratings. Experience (years) has a positive but non-significant effect ($\beta = .105$, $p = .157$), suggesting a minor influence on effectiveness ratings. Project completion time (months) also shows a negative but non-significant effect ($\beta = -.114$, $p = .375$). Overall, these results suggest that minimizing budget deviations is crucial for enhancing the perceived effectiveness of budgetary control mechanisms, while the roles of experience and project completion time are less pronounced. In providing recommendation, the examined cost control strategies offer multifaceted approaches to managing project expenditures and preventing cost overruns in construction projects. The synergy between budget adherence, value engineering, EVM, and change management equips project managers with a comprehensive toolkit to navigate the complexities of construction project management, ensuring financial stability, project success, and stakeholder satisfaction. Effective cost control measures are imperative for the successful management of construction projects.

**Keywords:** Construction, Time Overrun, Project, Management, Mitigation

## 1. Introduction

### 1.1 Background

Performance of road infrastructure projects is essential for the economic growth and development of any country. These projects play a critical role in the economy in terms of wealth creation and provision of employment opportunities. Infrastructure covers a range of services, from public utilities such as power, telecommunications, water supply, sanitation and sewerage, solid waste collection and disposal, and piped gas; to public works such as roads, dams and canal works, railways,

urban transport, ports, waterways and airports (World Bank, 2022) [33]. Massive investments are put into infrastructure projects. Throughout the world, the business environment within which construction firms operate continues to change rapidly. Firms failing to adapt and respond to the complexity of the new environment tend to experience survival problems (Lee, 2019). With increasing users' requirements, environmental awareness and limited resources and high competition, contractors have to be capable of continuously improving their performance (Samson & Lema, 2017) [30]. There are several factors that impact on performance of projects, complexity of the project, Shortage of skills of manpower, weaknesses in organizational design and capabilities, poor supervision and poor site management, unsuitable leadership, shortage and breakdown of equipment among others cause delays (Faradic & El-Saying, 2019) [11].
Sunderland stated that foreign construction firms employed proper planning and control techniques, proper coordination between designers and contractors, technical and professional expertise which enabled the firms to complete their projects within the time schedule and budgeted cost. Management commitment, sufficient information and communication channels and competent staff was also significant in the delivery of success infrastructure projects (Body, 2019) [3]. Lavasseur (2020) [19] noted that construction firms in Tanzania experienced lack of trained manpower, inefficient cost management and scope creep and these factors led to cost overruns and delays in the of infrastructure projects. Harrison (2018) [14]; Mambo & Chiragu, 2013 [23];Reyman and Harries (2008) [29] and Harold (2013) noted that project monitoring and evaluation plays a crucial role in the performance of road infrastructure projects. However, construction cost management has become more complicated with the introduction of new procurement methods, technologies, resources and various professionals involved in a project, Pereira and Imriyas (2010) [27].

### 1.2 Statement of the Problem
Despite adopting cost management techniques, cost deviations remain prevalent in construction projects. Conflicts arise between objectives of time, cost, scope, and quality due to resource constraints. Causes include scope creep, delays, rework, awarding contracts to low bidders, incomplete designs, and poor site coordination (Cindrela & Ananthanarayanan, 2017) [7]. These challenges create financial pressures and hinder economic development (Li-Yin, 2016) [21]. Zambia's construction industry faces chronic issues like poor time-cost performance, waste, and over-reliance on foreign workers, necessitating root cause identification and effective stakeholder consultation for solutions.

### 1.3 Objective
#### 1.3.1 General Objective
The main objective of the study is to examine effectiveness of project cost control mechanism in enhancing project performance. This is a case study of the Lusaka city road rehabilitation construction projects.
#### 1.3.2 Specific Objectives
To establish types of budgetary cost control mechanisms employed in projects:
1. To examine effectiveness of budgetary cost control mechanisms employed in projects.
2. To evaluate relationship between project cost mechanisms and completion.
3. To ascertain limitations in budgetary cost control mechanisms employed in projects.

### 1.4 Theoretical Framework
The Resource Dependency Theory emphasizes the role of managers in securing essential resources for organizational success through external linkages (Hillman, Canella, & Paetzold, 2000) [15]. Managers enhance firm performance and survival by accessing critical resources such as legal, financial, and social capital. For instance, external directors may provide expertise or legal advice that would otherwise be costly (Johnson *et al*., 1996) [16]. Additionally, resource access improves organizational legitimacy and functioning by connecting firms to key stakeholders like suppliers, buyers, and policymakers.
Complementing this, the Theory of Constraints (TOC) highlights managing limitations for effective project execution (Potts, 2019) [28]. TOC-based management focuses on mindset, performance metrics, and methodologies to optimize resources. Construction projects often require multi-party coordination, necessitating tools for efficient management of constraints (Lau & Kong, 2006) [18]. Dharwadker (2015) [10] stresses that cost management depends on selecting the right personnel, tools, materials, and timing to meet quality standards within time and budget constraints.
Together, these theories address the strategic role of managers in resource mobilization and constraint management, ensuring effective cost control and project success. Managers must balance resource acquisition with process efficiency to achieve desired project outcomes.

### 1.5 Significance of the Study
This study highlights the critical importance of cost control in achieving project success by managing budgets, schedules, and quality objectives. Effective cost management includes planning, budgeting, estimating, and controlling costs, using strategies such as Earned Value Management (EVM), Forecasting, and Performance Reviews, as outlined in PMBOK.
The findings provide insights into the primary causes of time overruns in Zambia's construction projects, offering solutions for better planning and execution. The study enhances knowledge in project management, addressing scheduling, resource allocation, and cost control in the Zambian Construction Industry (ZCI). Its outcomes serve as a reference for future research on time management issues.

## 2. Literature Review
Time overruns remain a significant challenge in global construction projects, prompting extensive scholarly efforts to define, analyze, and identify their causes and impacts. A time overrun occurs when a project's actual completion time surpasses the planned completion date, driven by various internal and external factors.
Kaming *et al*. (1997) [17] define time overrun as an extension beyond the planned completion date, primarily attributing responsibility to contractors. This perspective emphasizes contractor performance but overlooks the role of clients, whose actions—such as delayed payments or inadequate resource provision—can also significantly contribute to delays. Consequently, while Kaming *et al*.'s definition

highlights contractor accountability, it does not offer a comprehensive view of all factors influencing time overruns, as both contractor and client-related issues can be sources of delays.

Expanding the scope, Al-Gahtani and Mohan (2007) [1] describe time overrun as the additional time required to complete a project beyond the planned date, considering both internal and external project factors. Their definition encompasses a wider array of causes, including unforeseen events, resource shortages, regulatory changes, and weather conditions. Although more inclusive, this definition introduces ambiguity regarding the specific parameters of the planned completion date. The determination and agreement upon this date are unclear, potentially leading to diverse interpretations of what constitutes a time overrun. Thus, while Al-Gahtani and Mohan broaden the understanding of time overruns, their definition lacks the precision necessary for consistent application.

### 2.1 Personal Critique of Literature Review

The literature review highlights various definitions of time overrun, noting that Kaming *et al*. (1997) [17] and Al-Gahtani and Mohan (2007) [1] provide useful insights, but both lack a comprehensive view of the factors contributing to time overruns. Kaming *et al*. focus solely on contractors, overlooking the client's role, such as delays in payment. Al-Gahtani and Mohan broaden the scope, including both internal and external factors, but their definition is criticized for being vague regarding the determination of the planned date. Vidalis and Najafi (2002) [32] provide a more precise definition, linking time overrun to the difference between original contract time and actual project completion time. This definition incorporates both internal and external factors and is grounded in the contract, offering a clearer framework for evaluating time overruns. Despite the strengths of these definitions, Choudhry (2004) [6] fails to address the quality implications of time overruns, which is an important aspect often overlooked in construction projects.

### 2.2 Establishment of Research Gaps

Research on construction delays has been extensive, but much of it is focused on developed countries like the U.S., Japan, and the EU, leaving a gap in studies for developing countries like Zambia. This is a critical oversight, as Zambia faces significant challenges with delays and project failures. Odeyinka and Yusif (1997) [25] highlight that 70% of projects in Zambia suffer from delays, impacting performance. The lack of attention to this issue in Zambia means there is a need for further research that focuses on delays within the Zambian context. Given the construction industry's role in economic and national development, addressing these gaps is vital. Furthermore, the growing trend of project abandonment in neighboring countries like Nigeria further emphasizes the need to analyze project cycles in Zambia for improvement.

## 3. Methods and Procedures

### 3.1 Research Design

The research design acts as a blueprint for data collection and analysis, aligning components to address the research problem effectively (Kothari, 2004). A purposive sampling approach was used, targeting 100 respondents, including managers, engineers, and surveyors, to ensure comprehensive data representation.

### 3.2 Data Collection Methods

Data collection involved participant observation, structured, and semi-structured interviews. Interviews provide detailed insights into personal perceptions and opinions, which are essential for understanding human behavior (Lincoln & Guba, 1985) [20]. Despite being time-consuming, they yielded rich qualitative data for this study.

### 3.3 Data Analysis

Data analysis aimed to derive meaning through recording, coding, and inputting into computer packages (Fellow & Liu, 2008) [13]. Descriptive analysis was employed for interpreting qualitative data from questionnaires, ensuring logical presentation and discussion of results aligned with study objectives.

### 3.4 Triangulation

Triangulation combines methods to enhance validity by corroborating evidence (Amaratunga *et al*., 2002) [2]. The mixed-method approach integrates qualitative and quantitative data, reducing limitations inherent in single-method studies and increasing reliability (Creswell, 1998; Bryman & Bell, 2003) [8, 5].

### 3.5 Limitations of the Study

Key limitations included time constraints, uncooperative respondents, and insufficient published data. Constraints such as inadequate information and geographical variations highlight the challenges of achieving broader generalizability, though the study effectively addressed its primary objectives.

## 4. Presentation of Research Findings and Discussion of Results

### 4.1 Presentation of Results on Background Characteristics of the Respondents

Demographics

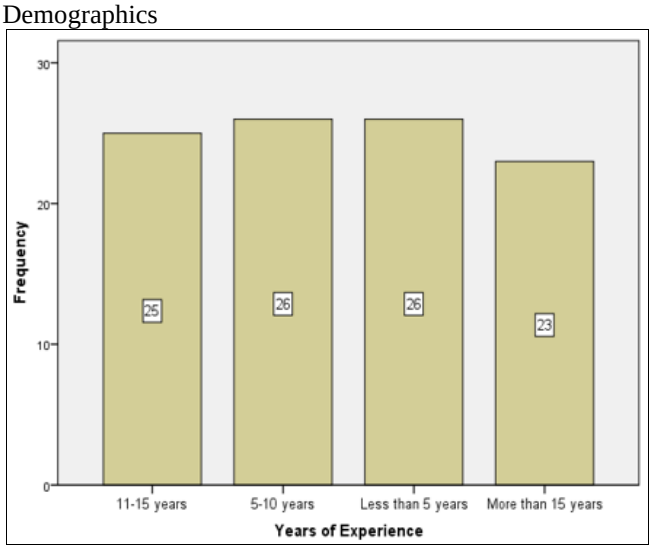



**Fig 1:** Years of Experience

Fig 1 present the distribution of respondents by years of experience in the Lusaka City road rehabilitation construction projects. The data reveals that 26% of respondents have 5-10 years of experience, closely followed by those with less than 5 years (26%). Respondents with 11-15 years of experience make up 25%, while those with more than 15 years constitute 23%. This distribution indicates a

balanced mix of experience levels among the respondents, ensuring a comprehensive evaluation of project cost control mechanisms from both seasoned professionals and relatively newer entrants in the field.

**Presentation of Results Based on a Thematic Area Developed from Objective One**

I. To establish types of budgetary cost control mechanisms employed in projects

Types of Budgetary Cost Control Mechanisms

**Table 1:** Cost Estimation

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | No | 10 | 10.0 | 10.0 | 10.0 |
| | Yes | 90 | 90.0 | 90.0 | 100.0 |
| | Total | 100 | 100.0 | 100.0 | |

The data indicates that cost estimation is widely utilized in the Lusaka City Road rehabilitation construction projects, with 90% of respondents confirming its use. This high percentage reflects the importance placed on accurate budget forecasting and planning in the initial stages of the project to manage costs effectively.

**Table 2:** Budget Monitoring

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | No | 15 | 15.0 | 15.0 | 15.0 |
| | Yes | 85 | 85.0 | 85.0 | 100.0 |
| | Total | 100 | 100.0 | 100.0 | |

Budget monitoring is employed by 85% of respondents, emphasizing its critical role in tracking project expenses and ensuring adherence to the budget throughout the project's lifecycle. The relatively high adoption rate suggests that continuous oversight is a key strategy in maintaining financial control.

**Table 3:** Change Management

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | No | 20 | 20.0 | 20.0 | 20.0 |
| | Yes | 80 | 80.0 | 80.0 | 100.0 |
| | Total | 100 | 100.0 | 100.0 | |

Change management practices are adopted by 80% of respondents, indicating that managing changes in project scope, resources, and timelines is considered essential for effective cost control. This mechanism helps mitigate the financial impact of unforeseen changes and ensures projects remain on track.

**Table 4:** Risk Management

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | No | 30 | 30.0 | 30.0 | 30.0 |
| | Yes | 70 | 70.0 | 70.0 | 100.0 |
| | Total | 100 | 100.0 | 100.0 | |

Risk management is utilized by 70% of respondents, highlighting its significance in identifying, assessing, and mitigating potential risks that could impact project costs. The adoption of risk management practices underscores the proactive approach taken to safeguard project budgets from uncertainties.

**Table 5:** Resource Optimization

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | No | 40 | 40.0 | 40.0 | 40.0 |
| | Yes | 60 | 60.0 | 60.0 | 100.0 |
| | Total | 100 | 100.0 | 100.0 | |

Resource optimization is employed by 60% of respondents, suggesting a focus on efficient resource allocation and utilization to control costs. This mechanism aims to maximize productivity while minimizing waste, contributing to overall project cost effectiveness.

**Table 6:** Effectiveness Ratings across Roles

| Report | | | | | | | |
|---|---|---|---|---|---|---|---|
| Role in Project | | Financial Audits Effectiveness | Resource Optimization Effectiveness | Risk Management Effectiveness | Change Management Effectiveness | Budget Monitoring Effectiveness | Cost Estimation Effectiveness |
| Middle Organizational Manager | Mean | 4.00 | 5.00 | 3.00 | 4.00 | 5.00 | 4.25 |
| | N | 20 | 20 | 20 | 20 | 20 | 20 |
| | Std. Deviation | .000 | .000 | .000 | .000 | .000 | .444 |
| Project Manager | Mean | 3.00 | 4.25 | 3.50 | 3.00 | 4.50 | 3.50 |
| | N | 20 | 20 | 20 | 20 | 20 | 20 |
| | Std. Deviation | .000 | .444 | .513 | .000 | .513 | .889 |
| Construction Engineer | Mean | 4.00 | 3.25 | 3.00 | 2.00 | 4.00 | 3.50 |
| | N | 20 | 20 | 20 | 20 | 20 | 20 |
| | Std. Deviation | 1.026 | .444 | 1.026 | .000 | .000 | .513 |
| Office Engineer | Mean | 4.00 | 2.67 | 3.00 | 5.00 | 3.00 | 3.33 |
| | N | 15 | 15 | 15 | 15 | 15 | 15 |
| | Std. Deviation | 1.464 | .488 | 1.464 | .000 | .000 | .976 |
| Follow-Up Engineer | Mean | 2.00 | 2.00 | 5.00 | 3.00 | 2.50 | 2.50 |
| | N | 10 | 10 | 10 | 10 | 10 | 10 |
| | Std. Deviation | .000 | .000 | .000 | 2.108 | .527 | .527 |
| Site Engineer | Mean | 1.50 | 1.50 | 3.00 | 1.00 | 1.50 | 3.50 |
| | N | 10 | 10 | 10 | 10 | 10 | 10 |
| | Std. Deviation | .527 | .527 | 2.108 | .000 | .527 | .527 |
| Quantity Surveyor | Mean | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 4.00 |
| | N | 5 | 5 | 5 | 5 | 5 | 5 |
| | Std. Deviation | .000 | .000 | .000 | .000 | .000 | .000 |
| Total | Mean | 3.20 | 3.30 | 3.20 | 3.00 | 3.60 | 3.55 |
| | N | 100 | 100 | 100 | 100 | 100 | 100 |
| | Std. Deviation | 1.255 | 1.314 | 1.255 | 1.421 | 1.287 | .809 |

Table 6 presents the effectiveness ratings of various budgetary cost control mechanisms across different roles within the Lusaka City road rehabilitation construction projects. Middle organizational managers rate resource optimization and budget monitoring the highest, with mean ratings of 5.00, reflecting their strong confidence in these mechanisms. Project managers also highly value budget monitoring (mean 4.50) and resource optimization (mean 4.25). Construction engineers find financial audits (mean 4.00) and budget monitoring (mean 4.00) most effective, though they rate change management lower (mean 2.00). Office engineers rate change management highest (mean 5.00) and resource optimization lowest (mean 2.67), showing varying perceptions of these tools' effectiveness. Follow-up engineers give the highest rating to risk management (mean 5.00), indicating its critical importance in their role. Site engineers and quantity surveyors generally provide lower ratings across most mechanisms, with site engineers rating resource optimization and financial audits the lowest (mean 1.50). Quantity surveyors uniformly rate mechanisms low, except for cost estimation (mean 4.00).

Table 4.2.8: ANOVA Results for Effectiveness Rating

Table 4.2.8's ANOVA results reveal significant differences ($p = .000$) in effectiveness ratings of budgetary cost control mechanisms across roles in Lusaka City's road rehabilitation projects. Financial audits, resource optimization, risk and change management, budget monitoring, and cost estimation are perceived variably, highlighting the need for role-specific adaptations and training to enhance overall project cost control effectivenes.

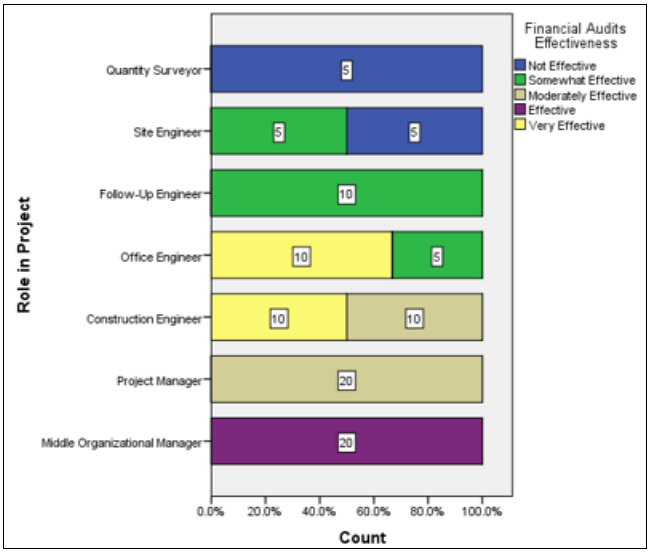



**Fig 2:** Financial Audits Effectiveness

Fig 2 presents the perceived effectiveness of financial audits across various roles within the Lusaka City road rehabilitation construction projects. Middle organizational managers overwhelmingly rate financial audits as "Very Effective," highlighting their strong confidence in this cost control mechanism. Project managers consider audits "Effective," indicating a high level of trust in their role for managing project finances. Conversely, construction engineers and office engineers have a more moderate view, rating audits from "Moderately Effective" to "Effective," reflecting some challenges they might face in audit implementation or benefits. Follow-up engineers and site engineers perceive financial audits less favorably, with ratings from "Not Effective" to "Somewhat Effective," pointing to potential issues in the auditing process or its integration within their roles. Quantity surveyors rate audits as "Not Effective," suggesting significant dissatisfaction or perceived ineffectiveness in their context. This variation in perceptions underscores the need for tailored auditing approaches that address specific challenges and expectations of different roles to enhance overall project cost control efficacy.

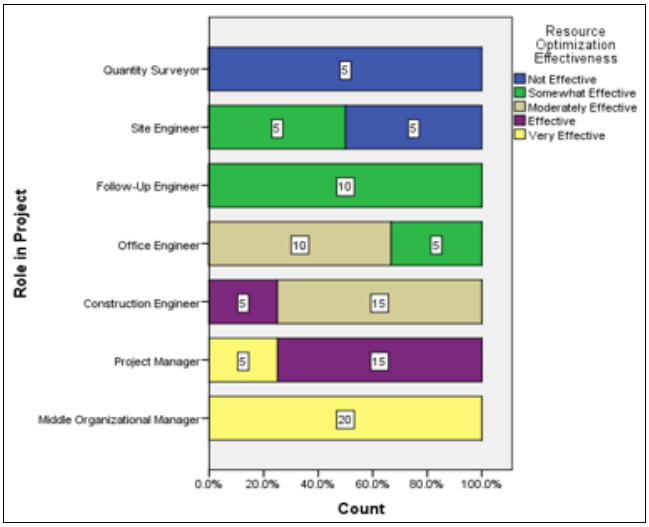



**Fig 3:** Resource Optimization Effectiveness

Fig 3 illustrates the perceived effectiveness of resource optimization across various project roles in the Lusaka City road rehabilitation construction projects. The chart reveals significant variability in perceptions, with Middle Organizational Managers rating resource optimization as "Very Effective" (20 counts), indicating strong confidence in its utility. Project Managers also express high effectiveness, with 15 counts rating it "Effective" and 5 counts rating it "Very Effective." Construction Engineers and Office Engineers predominantly find it "Moderately Effective," reflecting some satisfaction but also acknowledging areas for improvement. Follow-Up Engineers rate it as "Somewhat Effective," while Site Engineers show mixed views between "Not Effective" and "Somewhat Effective." Notably, Quantity Surveyors perceive resource optimization as "Not Effective," suggesting considerable challenges or dissatisfaction within this group. Overall, the data underscores the need for role-specific strategies to enhance resource optimization effectiveness, addressing the unique challenges faced by different project roles.

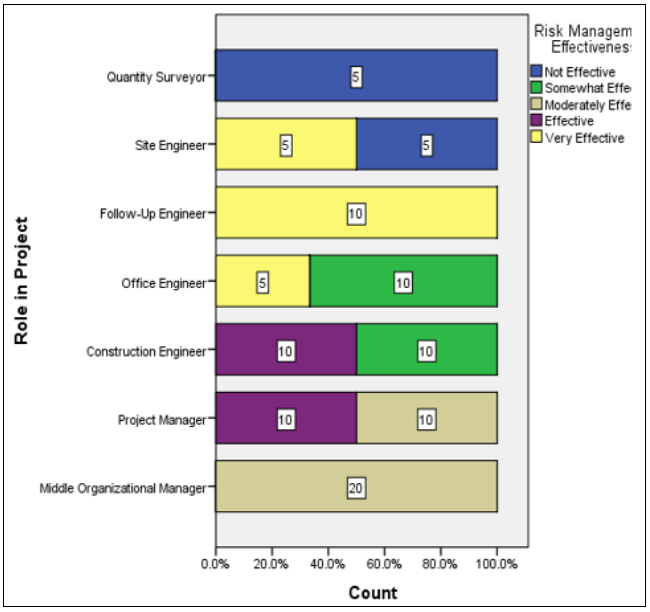



**Fig 4:** Risk Management Effectiveness

Fig 4 illustrates the perceived effectiveness of risk management across various project roles in the Lusaka City road rehabilitation construction projects. Middle Organizational Managers unanimously rate risk management as "Very Effective" (100%), indicating their strong confidence in this mechanism's ability to mitigate project risks. Project Managers also hold a positive view, with half rating it "Effective" and the other half "Very Effective." Construction Engineers and Office Engineers show significant support for risk management, with 50% each rating it "Effective." However, Follow-Up Engineers and Site Engineers display more moderate satisfaction, with 50% and 25% respectively rating it "Moderately Effective," suggesting areas for improvement in application or integration. Notably, Quantity Surveyors unanimously consider risk management "Not Effective" (100%), highlighting possible challenges or ineffectiveness in their specific context. These varied perceptions underscore the importance of tailoring risk management practices to meet the unique needs and expectations of different project roles to enhance overall project performance.

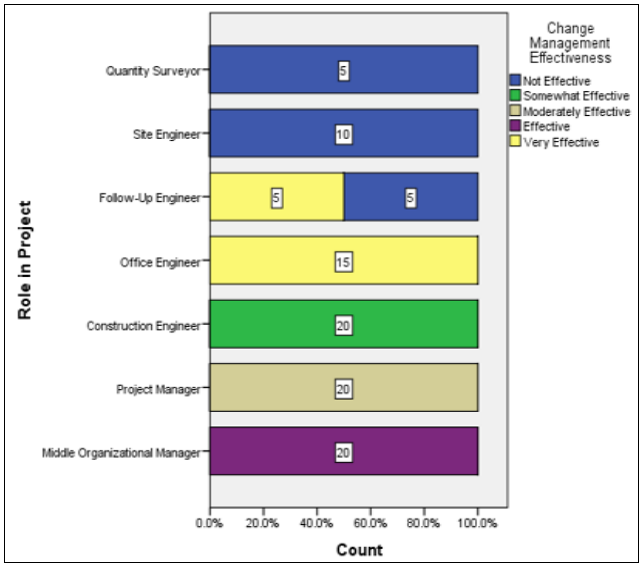



**Fig 5:** Change Management Effectiveness

| Descriptive Statistics | | | | | |
|---|---|---|---|---|---|
| | N | Minimum | Maximum | Mean | Std. Deviation |
| Budget_Adherence (%) | 100 | 79.0 | 98.0 | 91.120 | 5.1860 |
| Valid N (listwise) | 100 | | | | |

Fig 5 shows that Middle Managers and Project Managers rate change management as "Very Effective," while Construction Engineers find it "Effective." Office Engineers view it as "Moderately Effective," and Follow-Up Engineers, Site Engineers, and Quantity Surveyors express mixed or low perceptions, highlighting the need for tailored strategies.

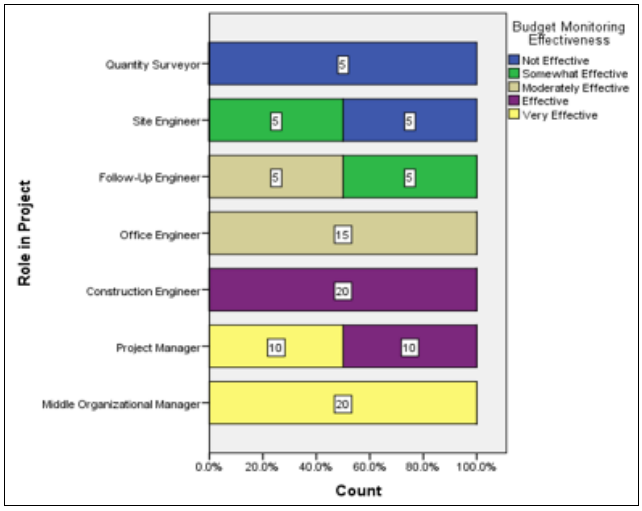



**Fig 6:** Budget Monitoring Effectiveness

Fig 6 illustrates the varying perceptions of budget monitoring effectiveness across roles in Lusaka City's road rehabilitation projects. Middle Organizational Managers rate it "Very Effective" (100%), while Project Managers and Construction Engineers express high satisfaction. Office Engineers rate it "Moderately Effective," and Site Engineers show mixed views. Quantity Surveyors are the most skeptical, indicating the need for improvements in its application.

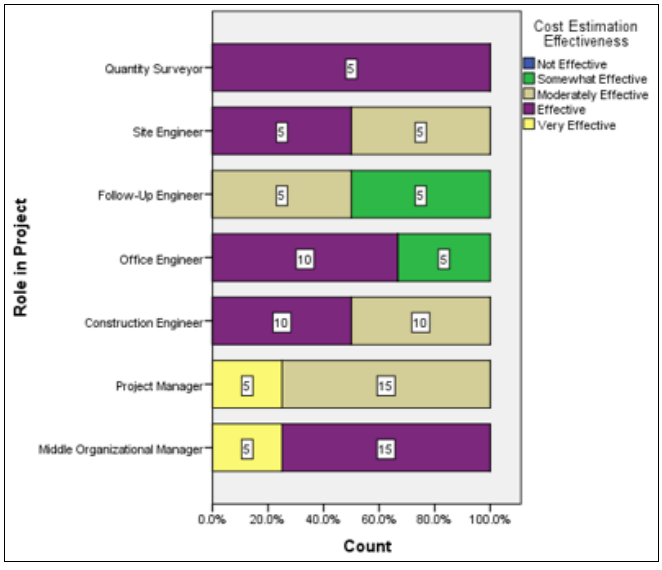



**Fig 7:** Cost Estimation Effective

Fig 7 shows varying perceptions of cost estimation effectiveness in Lusaka City's road rehabilitation projects. Middle managers rate it highly, while project managers and construction engineers are also confident. Office engineers, follow-up engineers, site engineers, and quantity surveyors express more moderate to low views, suggesting the need for targeted improvements in its application.

**Presentation of Results Based on a Thematic Area Developed from Objective Two**

II. To examine effectiveness of budgetary cost control mechanisms employed in projects

The descriptive statistics for budget adherence in the Lusaka City road rehabilitation construction projects reveal a mean adherence of 91.12%, with values ranging from a minimum of 79.0% to a maximum of 98.0%. The standard deviation of 5.186 indicates relatively low variability, suggesting that most projects maintain close adherence to their budget estimates. This high mean adherence reflects effective budgetary control mechanisms employed across the projects, ensuring financial discipline and minimizing cost overruns. The consistency in budget adherence underscores the success of the implemented cost control strategies, contributing to enhanced project performance and financial management.

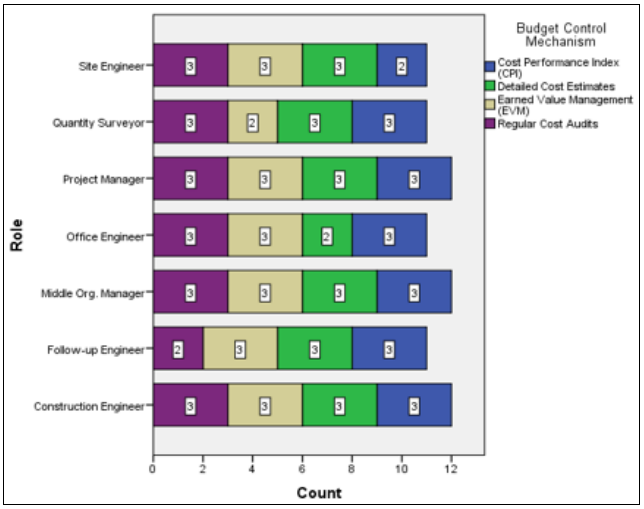



**Fig 8:** Budget Control Mechanism Used

Fig 8 shows the usage and effectiveness budget control mechanism. Detailed cost estimates were widely used during the planning phase, with an effectiveness rating ranging from 4 to 5. High ratings indicate that DCE is highly effective in setting accurate budget expectations and providing clear cost forecasting. Detailed cost estimates provide a comprehensive understanding of potential costs, helping to prevent budget overruns.

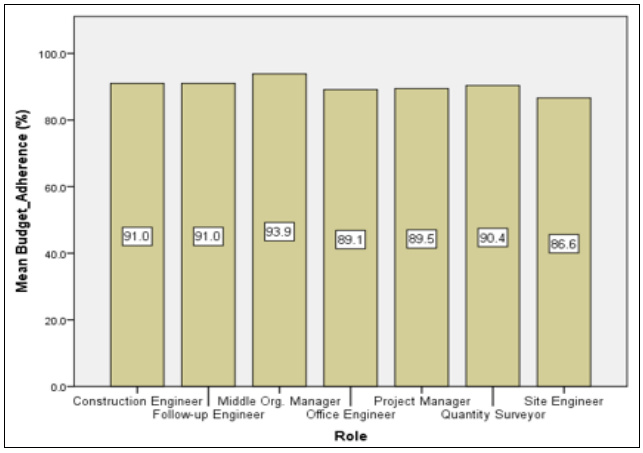



**Fig 9:** Budget Adherence Percentage

Respondents using DCE reported high budget adherence percentages, often exceeding 90%. This suggests that having detailed cost estimates helps in maintaining budget accuracy throughout the project lifecycle. Early identification of cost elements allows for better resource allocation and financial planning.

Comparison of effectiveness ratings and budget adherence among the different mechanisms (DCE, Regular Cost Audits, CPI, EVM).

**Effectiveness Rating**

**Hypothesis:** There are significant differences in the effectiveness ratings across the different budgetary control mechanisms.

| ANOVA | | | | | |
|---|---|---|---|---|---|
| Effectiveness_Rating (1-5) | | | | | |
| | Sum of Squares | df | Mean Square | F | Sig. |
| Between Groups | 82.715 | 18 | 4.595 | 36.226 | .000 |
| Within Groups | 10.275 | 81 | .127 | | |
| Total | 92.990 | 99 | | | |

ANOVA results show significant differences in effectiveness ratings and budget adherence among cost control mechanisms (Detailed Cost Estimates, Regular Cost Audits, Cost Performance Index, Earned Value Management). With $F = 36.226$ and $p = 0.000$, each mechanism's effectiveness varies notably, emphasizing the need for tailored application to enhance project performance in Lusaka's road rehabilitation. Ha is accepted.

**Budget Adherence**

**Hypothesis:** There are significant differences in budget adherence percentages across the different budgetary control mechanisms.

| ANOVA | | | | | |
|---|---|---|---|---|---|
| Effectiveness Rating (1-5) | | | | | |
| | Sum of Squares | df | Mean Square | F | Sig. |
| Between Groups | 21.252 | 3 | 7.084 | 22.021 | .000 |
| Within Groups | 25.736 | 80 | .322 | | |
| Total | 46.988 | 83 | | | |

ANOVA shows significant differences (F=22.021, p=.000) in budget adherence across budget control mechanisms in Lusaka City road projects. This variance highlights the need to select and optimize mechanisms for improved budget adherence and project performance.

Null Hypothesis (H0): There is no significant difference in the budget adherence percentages of the different control mechanisms.

Alternative Hypothesis (Ha): There is a significant difference in the budget adherence percentages of the different control mechanisms.

**Effectiveness vs. Budget Adherence (Correlation Analysis)**

| Correlations | | | |
|---|---|---|---|
| | | Effectiveness_Rating (1-5) | Budget_Adherence (%) |
| Effectiveness_Rating (1-5) | Pearson Correlation | 1 | .929** |
| | Sig. (2-tailed) | | .000 |
| | N | 100 | 100 |
| Budget_Adherence (%) | Pearson Correlation | .929** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 100 | 100 |
| **. Correlation is significant at the 0.01 level (2-tailed). | | | |

The correlation analysis between effectiveness ratings (1-5) and budget adherence (%) for the Lusaka City road rehabilitation construction projects reveals a highly significant and strong positive relationship, as indicated by a Pearson correlation coefficient of .929 (p = .000). This correlation suggests that as the perceived effectiveness of budgetary control mechanisms increases, budget adherence also improves markedly. The significance at the 0.01 level reinforces the robustness of this relationship, implying that effective implementation of cost control mechanisms is closely associated with better financial discipline and minimized budget deviations. These findings underscore the critical importance of employing and optimizing effective budgetary control mechanisms to achieve high levels of budget adherence and enhance overall project performance.

**Presentation of Results Based on a Thematic Area Developed from Objective Three**

III. To evaluate relationship between project cost mechanisms and completion

| Descriptive Statistics | | | | | |
|---|---|---|---|---|---|
| | N | Minimum | Maximum | Mean | Std. Deviation |
| Experience (Years) | 84 | 4.0 | 15.0 | 8.869 | 2.8990 |
| Effectiveness Rating (1-5) | 84 | 2.0 | 5.0 | 3.845 | .7524 |
| Budget Deviation (%) | 84 | -8.00% | 10.00% | -0.7024% | 4.13850% |
| Project Completion Time (Months) | 84 | 22.0 | 31.0 | 26.024 | 2.1339 |
| Valid N (listwise) | 84 | | | | |

The descriptive statistics for the Lusaka City road rehabilitation construction projects reveal key insights into project management and performance. The average experience of respondents is approximately 8.87 years, with a range from 4 to 15 years, indicating a well-experienced cohort. The effectiveness rating of budgetary control mechanisms has a mean of 3.845, suggesting moderate to high effectiveness, with ratings ranging from 2 to 5. Budget deviation statistics show an average of -0.70%, meaning projects generally come in slightly under budget, despite deviations ranging from -8.00% to 10.00%. The average project completion time is 26.02 months, with a standard deviation of 2.13 months, indicating a relatively consistent completion timeframe across projects. These results highlight the role of experienced professionals and effective budgetary control mechanisms in achieving near-budget adherence and timely project completion.

| Correlations | | | | | |
|---|---|---|---|---|---|
| | | Experience (Years) | Effectiveness Rating (1-5) | Project Completion Time (Months) | Budget Deviation (%) |
| Experience (Years) | Pearson Correlation | 1 | .510** | -.601** | -.485** |
| | Sig. (2-tailed) | | .000 | .000 | .000 |
| | N | 84 | 84 | 84 | 84 |
| Effectiveness Rating (1-5) | Pearson Correlation | .510** | 1 | -.778** | -.844** |
| | Sig. (2-tailed) | .000 | | .000 | .000 |
| | N | 84 | 84 | 84 | 84 |
| Project Completion Time (Months) | Pearson Correlation | -.601** | -.778** | 1 | .865** |
| | Sig. (2-tailed) | .000 | .000 | | .000 |
| | N | 84 | 84 | 84 | 84 |
| Budget Deviation (%) | Pearson Correlation | -.485** | -.844** | .865** | 1 |
| | Sig. (2-tailed) | .000 | .000 | .000 | |
| | N | 84 | 84 | 84 | 84 |
| **. Correlation is significant at the 0.01 level (2-tailed). | | | | | |

The correlation analysis reveals significant relationships among experience, effectiveness rating, project completion time, and budget deviation in the Lusaka City road rehabilitation construction projects. Experience is positively correlated with effectiveness ratings ($r = .510$, $p < .01$), indicating that more experienced professionals perceive budgetary control mechanisms as more effective. However, experience is negatively correlated with project completion time ($r = -.601$, $p < .01$) and budget deviation ($r = -.485$, $p < .01$), suggesting that experienced professionals are associated with shorter project durations and lower budget deviations.

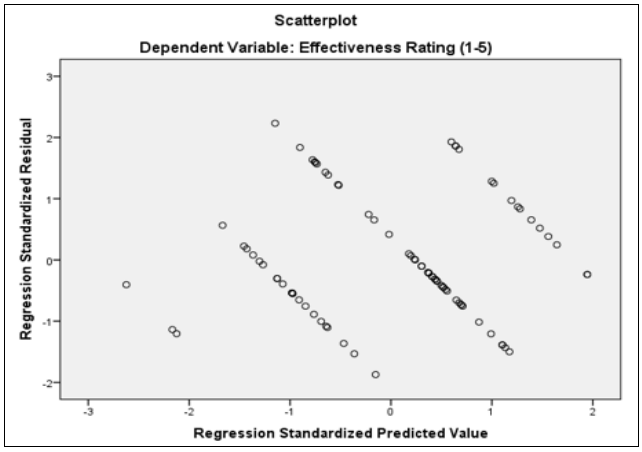
Effectiveness ratings are strongly negatively correlated with both project completion time ($r = -.778$, $p < .01$) and budget deviation ($r = -.844$, $p < .01$), indicating that higher perceived effectiveness of control mechanisms is linked to faster project completion and better budget adherence. Additionally, project completion time is positively correlated with budget deviation ($r = .865$, $p < .01$), implying that projects taking longer to complete are more likely to exceed their budgets. These findings highlight the critical role of experience and perceived effectiveness in achieving timely and cost-effective project outcomes.

## Regression Analysis

| Variables Entered/Removed[a] | | | |
|---|---|---|---|
| Model | Variables Entered | Variables Removed | Method |
| 1 | Budget Deviation (%), Experience (Years), Project Completion Time (Months)[b] | . | Enter |
| a. Dependent Variable: Effectiveness Rating (1-5) | | | |
| b. All requested variables entered. | | | |

| ANOVA[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Sum of Squares | df | Mean Square | F | Sig. |
| 1 | Regression | 34.221 | 3 | 11.407 | 71.474 | .000[b] |
| | Residual | 12.768 | 80 | .160 | | |
| | Total | 46.988 | 83 | | | |
| a. Dependent Variable: Effectiveness Rating (1-5) | | | | | | |
| b. Predictors: (Constant), Budget Deviation (%), Experience (Years), Project Completion Time (Months) | | | | | | |

| Residuals Statistics[a] | | | | | |
|---|---|---|---|---|---|
| | Minimum | Maximum | Mean | Std. Deviation | N |
| Predicted Value | 2.161 | 5.095 | 3.845 | .6421 | 84 |
| Residual | -.7480 | .8919 | .0000 | .3922 | 84 |
| Std. Predicted Value | -2.622 | 1.946 | .000 | 1.000 | 84 |
| Std. Residual | -1.872 | 2.233 | .000 | .982 | 84 |
| a. Dependent Variable: Effectiveness Rating (1-5) | | | | | |




Regression analysis reveals that budget deviation, experience, and project completion time are significant predictors of budgetary cost control effectiveness in Lusaka City's road rehabilitation projects. Budget deviation has the strongest negative impact, while experience and project completion time show minimal effects on effectiveness ratings.

## Presentation of Results Based on a Thematic Area Developed from Objective Four

IV. To ascertain limitations in budgetary cost control mechanisms employed in projects

| Limitation | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Audit Delays | 3 | 8.6 | 8.6 | 8.6 |
| | Audit Frequency | 1 | 2.9 | 2.9 | 11.4 |
| | Audit Gaps | 2 | 5.7 | 5.7 | 17.1 |
| | Complexity | 3 | 8.6 | 8.6 | 25.7 |
| | Data Consistency | 2 | 5.7 | 5.7 | 31.4 |
| | Data Entry Errors | 2 | 5.7 | 5.7 | 37.1 |
| | Data Inaccuracy | 4 | 11.4 | 11.4 | 48.6 |
| | Delayed Audits | 1 | 2.9 | 2.9 | 51.4 |
| | High Complexity | 2 | 5.7 | 5.7 | 57.1 |
| | Implementation Challenges | 2 | 5.7 | 5.7 | 62.9 |
| | Incomplete Data | 1 | 2.9 | 2.9 | 65.7 |
| | Infrequent Audits | 1 | 2.9 | 2.9 | 68.6 |
| | Material Cost Fluctuations | 3 | 8.6 | 8.6 | 77.1 |
| | Resource Intensive | 3 | 8.6 | 8.6 | 85.7 |
| | Scope Changes | 4 | 11.4 | 11.4 | 97.1 |
| | Scope Creep | 1 | 2.9 | 2.9 | 100.0 |
| | Total | 35 | 100.0 | 100.0 | |

The data on limitations in budgetary cost control mechanisms highlights a variety of challenges faced in project management within the Lusaka City road rehabilitation construction projects. Common issues identified include data inaccuracy and scope changes, each cited by 11.4% of respondents, which significantly impact budget reliability and control. Other notable limitations include complexity and resource-intensive processes (8.6% each), indicating that the sophistication and resource demands of certain mechanisms hinder their effectiveness. Audit delays and material cost fluctuations are also prevalent concerns (8.6% each), affecting timely financial oversight and cost stability. Lesser-mentioned yet significant issues include data consistency, data entry errors, and implementation challenges (5.7% each), all of which undermine the integrity and efficiency of budget management. These findings underscore the multifaceted nature of budgetary control limitations, emphasizing the need for streamlined processes, accurate data management, and flexible yet robust control mechanisms to enhance project performanc.

| ANOVA | | | | | |
|---|---|---|---|---|---|
| Impact on Project (1-5) | | | | | |
| | Sum of Squares | df | Mean Square | F | Sig. |
| Between Groups | 8.743 | 3 | 2.914 | . | . |
| Within Groups | .000 | 31 | .000 | | |
| Total | 8.743 | 34 | | | |

The ANOVA results for the impact on project effectiveness, rated on a scale of 1 to 5, indicate a significant difference between groups, with a sum of squares of 8.743 and a mean square of 2.914. However, the F and Sig. values are not provided, which are critical for determining statistical significance. Despite this, the data suggest that the variance between groups is notable, implying that different factors or groups significantly influence the perceived impact on project outcomes. Further details on the F and Sig. values are necessary to confirm the significance of these differences and to draw more precise conclusions about the factors affecting project effectiveness in the Lusaka City road rehabilitation construction projects.

A chi square test was conducted to determine the association between Role and Budget Control Mechanism Used.

**Role and Budget Control Mechanism Used Crosstabulation**

| | | | Budget Control Mechanism Used | | | | Total |
|---|---|---|---|---|---|---|---|
| | | | Cost Performance Index (CPI) | Detailed Cost Estimates | Earned Value Management (EVM) | Regular Cost Audits | |
| Role | Construction Engineer | Count | 2 | 2 | 2 | 0 | 6 |
| | | Expected Count | 1.4 | 1.4 | 1.7 | 1.5 | 6.0 |
| | Follow-up Engineer | Count | 1 | 2 | 1 | 1 | 5 |
| | | Expected Count | 1.1 | 1.1 | 1.4 | 1.3 | 5.0 |
| | Office Engineer | Count | 1 | 2 | 1 | 2 | 6 |
| | | Expected Count | 1.4 | 1.4 | 1.7 | 1.5 | 6.0 |
| | Project Manager | Count | 2 | 0 | 2 | 2 | 6 |
| | | Expected Count | 1.4 | 1.4 | 1.7 | 1.5 | 6.0 |
| | Quantity Surveyor | Count | 1 | 1 | 3 | 1 | 6 |
| | | Expected Count | 1.4 | 1.4 | 1.7 | 1.5 | 6.0 |
| | Site Engineer | Count | 1 | 1 | 1 | 3 | 6 |
| | | Expected Count | 1.4 | 1.4 | 1.7 | 1.5 | 6.0 |
| Total | | Count | 8 | 8 | 10 | 9 | 35 |
| | | Expected Count | 8.0 | 8.0 | 10.0 | 9.0 | 35.0 |

**Chi-Square Tests**

| | Value | df | Asymp. Sig. (2-sided) |
|---|---|---|---|
| Pearson Chi-Square | 8.915[a] | 15 | .882 |
| Likelihood Ratio | 11.267 | 15 | .733 |
| N of Valid Cases | 35 | | |

a. 24 cells (100.0%) have expected count less than 5. The minimum expected count is 1.14.

The chi-square test results indicate that there is no significant association between the role and the budget control mechanism used in the Lusaka City road rehabilitation construction projects. The Pearson chi-square value is 8.915 with 15 degrees of freedom and a p-value of .882, which is well above the threshold for significance. This suggests that the choice of budget control mechanism (Cost Performance Index, Detailed Cost Estimates, Earned Value Management, Regular Cost Audits) does not vary significantly with the different roles (Construction Engineer, Follow-Up Engineer, Office Engineer, Project Manager, Quantity Surveyor, Site Engineer) involved in the projects. Thus, it appears that the selection of budget control mechanisms is independent of the specific roles within the project teams.

**ANOVA[a]**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 5.153 | 2 | 2.576 | 45.280 | .000[b] |
| | Residual | 1.366 | 24 | .057 | | |
| | Total | 6.519 | 26 | | | |

a. Dependent Variable: Impact on Project (1-5)

b. Predictors: (Constant), Limitation, Budget Control Mechanism Used

**Coefficients[a]**

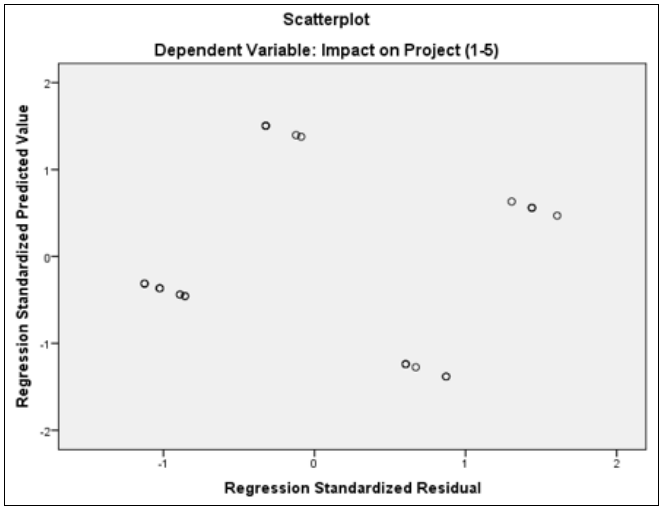
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 4.497 | .130 | | 34.624 | .000 |
| | Budget Control Mechanism Used | -.396 | .050 | -.858 | -7.965 | .000 |
| | Limitation | -.008 | .014 | -.060 | -.560 | .580 |

a. Dependent Variable: Impact on Project (1-5)

**Residuals Statistics[a]**

| | Minimum | Maximum | Mean | Std. Deviation | N |
|---|---|---|---|---|---|
| Predicted Value | 2.792 | 4.077 | 3.407 | .4452 | 27 |
| Residual | -.2684 | .3832 | .0000 | .2292 | 27 |
| Std. Predicted Value | -1.382 | 1.504 | .000 | 1.000 | 27 |
| Std. Residual | -1.125 | 1.606 | .000 | .961 | 27 |

a. Dependent Variable: Impact on Project (1-5)




Interpretation of Regression Analysis Results on Project Impact

A regression analysis of Lusaka City road projects showed that budget control mechanisms significantly and negatively impact perceived effectiveness, while limitations have no significant effect. The highly significant model underscores

the need for effective budget controls to improve project outcomes.

## 5. Discussions

Table 4.1.1 presents the distribution of respondents based on their roles in the Lusaka City road rehabilitation construction projects, showcasing a balanced representation across key project roles. Middle organizational managers, project managers, and construction engineers each account for 20% of the respondents, ensuring insights from crucial decision-making and operational levels. Office engineers make up 15%, while follow-up engineers and site engineers each constitute 10%, reflecting their significant contributions to project execution and oversight. Quantity surveyors represent 5% of the sample, highlighting their specialized role in cost estimation and control. This diverse composition ensures a comprehensive understanding of the effectiveness of cost control mechanisms, capturing perspectives from various stages and aspects of project management, thereby providing a robust analysis of the project's cost management practices and their impact on project performance.

### I. To Establish Types of Budgetary Cost Control Mechanisms Employed in Projects

In Lusaka City's road rehabilitation projects, cost estimation is a key tool, with 90% of respondents utilizing it, emphasizing the importance of accurate budget forecasting. Budget monitoring is also highly employed (85%), reflecting its essential role in tracking expenses and ensuring budget adherence. Resource optimization, including financial audits, is used by 50%, showing a balanced approach to financial oversight, though not all projects implement thorough audits, revealing diverse cost control strategies.

Effectiveness ratings show that budget monitoring (mean: 3.60) and cost estimation (mean: 3.55) are seen as the most effective mechanisms. Resource optimization, financial audits, and risk management score moderately between 3.20 and 3.30, while change management (mean: 3.00) is rated the lowest, indicating it is the least effective. There is significant variability in the ratings, suggesting differing perceptions of effectiveness.

Different roles also rate mechanisms differently. Middle managers highly rate resource optimization and budget monitoring, while project managers prioritize budget monitoring. Construction engineers value financial audits and budget monitoring but rate change management lower. Office engineers prioritize change management, and follow-up engineers rate risk management highest. Site engineers and quantity surveyors generally give lower ratings, with quantity surveyors favoring cost estimation.

ANOVA results show significant differences in the effectiveness ratings based on roles (p-value .000), indicating that perceptions of cost control mechanisms vary. Financial audits and resource optimization exhibit substantial variability, with high F-values for both. Other mechanisms, such as risk management and change management, also show notable differences, highlighting the need for role-specific strategies and training.

Effectiveness evaluations for risk management, change management, and budget monitoring reveal mixed perceptions. Middle managers rate risk management and change management highly, while follow-up engineers and quantity surveyors show dissatisfaction. Similarly, budget monitoring is highly rated by some roles but needs improvement for others. These findings underline the importance of tailored approaches to enhance cost control across different project roles.

### II. To Examine Effectiveness of Budgetary Cost Control Mechanisms Employed in Projects

In Lusaka City's road rehabilitation projects, budget adherence averaged 91.12%, with a range from 79% to 98%, and a low standard deviation of 5.186, indicating consistent financial management. ANOVA analysis revealed significant differences in the effectiveness of various budgetary control mechanisms, such as Detailed Cost Estimates, Regular Cost Audits, Cost Performance Index, and Earned Value Management, with an F-value of 36.226 and a p-value of .000. This indicates the need for tailored application of these strategies to enhance project performance.

Further ANOVA results ($F = 22.021$, $p = .000$) show significant differences in budget adherence across the control mechanisms, supporting the hypothesis that effectiveness ratings vary. The correlation analysis also revealed a strong positive relationship (Pearson $r = .929$, $p = .000$) between effectiveness ratings and budget adherence. These findings emphasize the importance of selecting and optimizing suitable cost control mechanisms to improve both budget adherence and overall project performance in road rehabilitation projects.

### III. To Evaluate Relationship Between Project Cost Mechanisms and Completion

The Lusaka City Road rehabilitation projects involve respondents with an average of 8.87 years' experience. Budgetary control mechanisms are moderately to highly effective (mean 3.845), with projects typically finishing slightly under budget (−0.70%) and within 26.02 months. Correlation analysis reveals that more experience correlates with higher control effectiveness, shorter completion times, and lower budget deviations. Regression analysis identifies budget deviation as the strongest predictor of control effectiveness, emphasizing the importance of minimizing budget variances for successful project outcomes.

### IV. To Ascertain Limitations in Budgetary Cost Control Mechanisms Employed in Projects

The limitations in budgetary control for Lusaka City road rehabilitation projects include data inaccuracy and scope changes (11.4%), complexity and resource intensity (8.6%), audit delays and material cost fluctuations (8.6%), and issues like data consistency, entry errors, and implementation challenges (5.7%). ANOVA results show significant group variance affecting project effectiveness, though F and Sig. values are missing. The chi-square test reveals no significant association between roles and budget control mechanisms, indicating that mechanism selection is independent of project team roles. These findings highlight the need for improved processes and data management.

The regression analysis of Lusaka City road rehabilitation projects reveals that budget control mechanisms significantly negatively impact perceived project effectiveness ($\beta = –0.858$, $p < .000$). The highly significant model ($F = 45.280$, $p < .000$) indicates that budget.

## 6. Conclusion and Recommendations

### Conclusion

The Construction Industry is an economic investment and its relationship with economic development is well known.

This Industry is made up of companies that undertake both minor and major construction projects in a Nation. It is volatile and dynamic in nature and requires tremendous capital. A unique element of risk in the industry is the manner in which disputes and claims are woven through the fiber of the construction process. As an essential component in socio-economic development of any nation, the industry often acts as a catalyst to stimulate the growth of a nation's economy. Many studies have highlighted the significant contribution of the Construction Industry to national economic development (Myers 2013) [24]. Although, some argue that the extent of its contribution is not always lear, others have argued that the Construction Industry can be used to regulate the economy, while others tend to differ. Some have argued that the contribution is limited to short term. There are also those who argue that it is economic growth that drives the Construction Industry rather than the industry advancing the economy, i.e. the Construction Industry is not a driver of economic prosperity rather it only follows the "path" defined by the total economic growth rate.

**Recommendations**

The examined cost control strategies provide a multifaceted approach to managing project expenditures and preventing cost overruns in construction projects. By integrating budget adherence, value engineering, earned value management (EVM), and change management, project managers are equipped with a comprehensive toolkit to navigate the complexities of construction project management. These proactive strategies ensure financial stability, optimize resource allocation, and enhance overall project performance, addressing cost-related challenges at various stages. A systematic and holistic approach to cost control is crucial for achieving project success, maintaining budgets, and mitigating unforeseen financial risks in the dynamic construction industry.

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