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Analyzing Risk Management in Procurement Processes: A Case Study of Chinsali-Nakonde Road

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Abstract

During the entire construction phase, road construction companies face numerous hazards in the procurement process. Risk affects many aspects of operations, profitability, and reputation in the supply chain. These risks can include bad logistics, supplier defaults, natural disasters, or unstable geopolitical events. The main objective of this study was to analyze risk management in project procurement options used on the Chinsali-Nakonde road construction project. Primary data was gathered using a semi-structured questionnaire with both closed- and open-ended questions. Statistical Package for the Social Sciences (SPSS) version 26 was used for data entry and statistical analysis. Graphical presentation of descriptive statistics was done using Microsoft Excel 365. Chi-square was used for inferential statistics in order to determine the relationships between the variables. The study highlights significant challenges related to cost overruns in construction projects, with 69.7% of respondents frequently encountering this issue, and a strong statistical correlation between educational background and the frequency of cost overruns, as indicated by a Pearson Chi-Square value of 25.109 ($p < 0.001$). Supplier failure emerged as a critical concern, rated as "very significant" or "extremely significant" by over 74% of participants, while supplier delays were reported as a lesser issue, with 79% of respondents rarely experiencing them. Quality control measures were recognized as essential to project success, with 66.7% of respondents acknowledging their contribution.

Keywords: Risk Management, Procurement Processes, Risk, Risk Management

1. Introduction

1.1 Background to the study

Risk management in procurement has been very cardinal in order to promote effective procurement management (Lenderink, 2019). Procurement processes play a very fundamental role in the success of a project. It is very important to note that all projects contain risks that should be managed, however construction has proved to have higher risks due to the involvement of a lot of uncertainty and therefore must be carefully managed. Risk especially in procurement must start at an early stage of the project **(**Dvorsky, 2021**)** [12].

In Zambia risk in construction is very wide spread making the management of risk a priority. According to Tembo et al (2015) [35] 75% of risks are allocated to contractors whilst the design team had 25%. Contractors stated that any delay or departure from the signed construction contract will lead to breach of contract and hence failure to execute the desired needs of the client. The traditional procurement management option has been proven to be mostly used in Zambia though it only gives 11% in risk management. The common risk mitigation method is the Integrated Risk Management.

1.2 General Objective

To analyze risk management in project procurement options used on the Chinsali-Nakonde road construction project.

1.3 Specific objectives

1. To Establish the risks involved in project procurement options in the construction of the Chinsali-Nakonde road.
2. To analyze how risks are managed in project procurement options in the construction of the Chinsali-Nakonde road.
3. To determine the level of awareness of risk in procurement among the project members in the construction of the Chinsali-Nakonde road.
4. To identify the challenges faced in managing procurement risks in the construction of the Chinsali-Nakonde road.

1.4 Research questions

1. What are the risks involved in procurement options used in the construction of the Chinsali-Nakonde road?
2. How are the risks shared and managed throughout the construction of the Chinsali-Nakonde road?
3. What is the level of awareness of risks among project team members in project procurement options?
4. What challenges are faced in managing procurement risks in the construction of the Chinsali-Nakonde road?

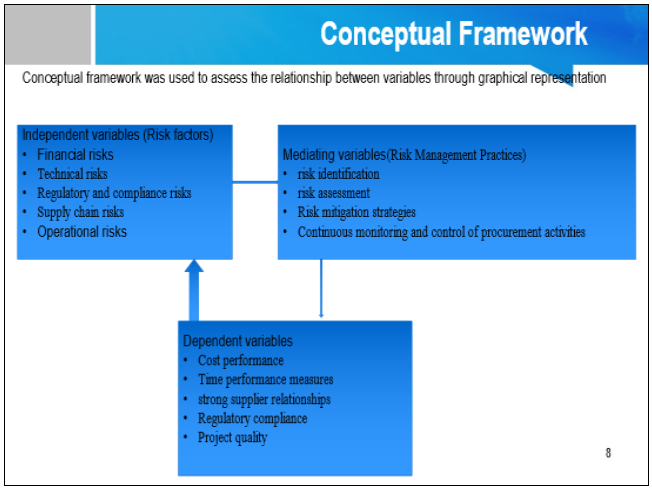

Fig 1: Conceptual Framework

2. Literature Review

This chapter reviews literature to understand the current state of knowledge, identify critical gaps and points of disagreement in this field and how this current study can contribute to it.

2.1 Risk involved in project procurement option

One of the most significant risks in project procurement is the reliability of suppliers. There is always a risk that suppliers might not deliver goods or services on time, within budget, or up to the required quality standards (Lysons, 2020**)** [23]**.** Delays in delivery can severely impact project timelines, leading to cascading effects on subsequent phases of the project (Yevu, 2021) [36]. Budget overruns are another critical concern; suppliers may initially quote competitive prices, but unexpected cost increases can arise due to market fluctuations, mis-estimations, or additional charges for expedited services (Ahmed, 2022) [2]. This can strain the project budget, necessitating reallocation of funds from other areas or seeking additional financial resources. Furthermore, the quality of the delivered goods or services is paramount. If the supplied materials do not meet the specified standards, it may lead to significant issues such as increased defect rates, rework, and potential failure to meet the project's overall objectives (Ghonami, 2024) [18]. Ensuring that suppliers adhere to agreed-upon quality standards is crucial for maintaining the integrity and success of the project (Ma, 2021) [24].

2.2 Risk management in project procurement options

Risk management in project procurement is a critical component of successful project management (Babatunde, 2019) [5]. It involves identifying, assessing, and mitigating risks associated with procuring goods and services necessary for project completion. Effective risk management strategies ensure that procurement activities align with project objectives, budget constraints, and timelines while minimizing potential disruptions and financial losses Agbeka et al (2024) [1]. Once risks are identified in the project procurement process, the next critical step is to assess their potential impact and likelihood. This involves a comprehensive evaluation of the severity of each risk and its probability of occurrence (Elsawah, 2020). Understanding both dimensions is essential for prioritizing risks and allocating resources effectively to mitigate them (Qazi, 2021) [31].

2.3 Level of awareness of risks among project team members

In the context of project procurement management, the level of awareness of risks among project team members plays a crucial role in the successful identification, assessment, and mitigation of potential issues (Rane, 2020) [22]. High awareness levels ensure that risks are promptly recognized and addressed, while low awareness can lead to overlooked threats and increased vulnerability to project disruptions (Callaghan, S. 2023) [7]. This discussion explores the factors influencing risk awareness among project team members, the importance of cultivating this awareness, and strategies to enhance it within project teams. Awareness of risks among project team members is fundamental to proactive risk management **(**Obayi, 2021) [28]. When team members are knowledgeable about potential procurement risks, they can contribute to early identification and timely mitigation. process (Sarvari, 2019) [20]. This collective vigilance helps prevent minor issues from escalating into major problems that could derail the project. Furthermore, risk-aware team members are more likely to engage in practices that minimize risks, such as adhering to quality standards, maintaining clear communication, and following established protocols (Braumann, 2019) [6].

2.4 Personal critique of literature review

Most of the studies on this topic have not been done in Zambia instead they have been done in western countries.

2.5 Establishment of research gaps

Quantifying Risk Impact: While existing literature identifies various risks, a gap exists in quantifying their potential impact on project outcomes (cost, schedule, quality). Research could involve:

Mitigating Risk Interdependence:

Literature acknowledges the interconnectedness of risks, but a gap exists in exploring how to mitigate the cascading effects of one risk triggering another.

Risk Management in Agile Procurement:

Traditional risk management approaches might not fully address the dynamic nature of agile procurement.

3. Research Methodology

This chapter presents the research design, the target population, the sample size, sampling and data collection procedures, analysis methods, and the instruments that will be used.

3.1 Research design

Study design refers to a collection of instruments and techniques intended for specific application, detailing the rationale and methods behind their usage. Meanwhile, a research design serves as a roadmap that directs researchers in their data collection, analysis, and interpretation endeavors, aiming to address research inquiries. Considering this, the present investigation embraced a cross-sectional survey study design, employing a quantitative methodology for gathering primary data. This approach allowed for the collection of data at a single point in time, offering a snapshot of the variables under investigation (Resharm, 2015) [32]. Through the quantitative methodology, the study gathered numerical data and employ statistical analysis techniques to draw conclusions and establish relationships among variables.

3.2 Target population

By definition, a population is defined as a collection of objects, events, or individuals sharing common characteristics that the researcher is interested in studying (Shukla, 2020) [33]. The target population for this study consisted of procurement officers, project managers, engineers, and architects at China Railway Seventh Group, a construction company responsible for constructing the Chinsali-Nakonde road.

3.3 Sampling design

The study employed convenience sampling technique. This method involved deliberate selection of specific individuals or groups from the target population at based on predefined criteria that are relevant to the research objectives.

3.4 Sample size determination

A sample is a subset of a population that is used to represent the entire group (Singh and Masuku 2014) [34]**.** The sample size for this study consisted 66 participants.

3.5 Data Collection Methods

The main research tool used in the study was a semi-structured questionnaire consisting of closed-ended questions. Primary data was collected through structured surveys. These methods involved the use of standardized questionnaires and face-to-face interview but mostly electronic questionnaire to gather data on the study variables.

3.6 Data Analysis

STATA was used for data entry and statistical analysis. Graphical presentation of descriptive statistics was done using Microsoft Excel 365. Chi-square was used for inferential statistics in order to determine the relationships between the variables.

3.7 Triangulation

The study employed triangulation as a research strategy to enhance the validity and reliability of the findings. Triangulation involved the use of multiple data sources, data collection methods, and/or researchers' perspectives to corroborate and cross-verify research results. (Noble and Heale 2019) [27]. In this study, triangulation was achieved by obtaining quantitative data collected through surveys. This approach helped mitigate potential biases and provided a more comprehensive and accurate understanding of the research phenomenon, increasing the overall robustness of the study's conclusions.

3.8 Limitations of the study

When conducting an analysis on risk management in procurement management for the Chinsali-Nakonde road project, several limitations affected the study's comprehensiveness, accuracy, and generalizability.

Limited Scope and Generalizability:

Context-Specific Findings: The findings from the Chinsali-Nakonde road project were specific to the socio-economic, political, and environmental context of the region. Therefore, generalizing the results to other projects or regions might not be appropriate.

Single Case Study: The study focused on a single project, which limited the ability to draw broad conclusions applicable to other projects with different scopes, scales, or locations.

3.9 Ethical Consideration

The study upheld ethical aspects including obtaining informed consent, safeguarding participant confidentiality and privacy, and utilizing acquired information solely for academic reasons. Stringent confidentiality measures were in place. Equal and unbiased treatment was given to all participants, who held the choice to participate or decline without any adverse effects. This research carried no risk of physical harm.

4. Characteristics of Respondents

This section provides a detailed analysis of the outcomes achieved, including any statistical or quantitative analysis conducted to support the findings.

4.1 Presentation of results on background characteristics of the respondents

The majority of the respondents were male, with 46 individuals (69.7%) identifying as male, while 20 respondents (30.3%) were female. This distribution showed that male participants were more prevalent in the sample.

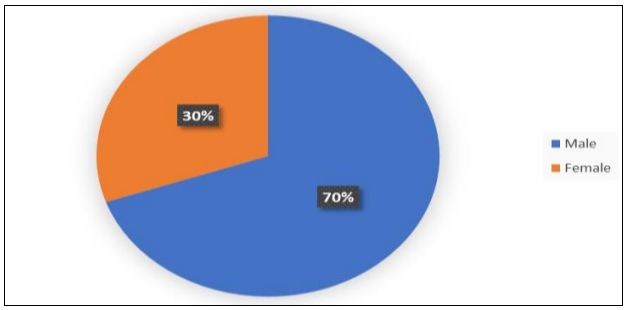

Fig 2: Gender of Respondents

The age of respondents ranged from 25 to 53 years, with a mean age of 38.08 years and a standard deviation of 8.558. This suggested that the respondents were primarily middle-aged professionals, with a reasonable spread in age.

Table 1: Participant's age

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Age	66	25	53	38.08	8.558
Valid N (listwise)	66				

Regarding educational qualifications, most respondents held advanced degrees. Specifically, 32 respondents (48.5%) had a Master's degree, followed by 28 respondents (42.4%) with a Bachelor's degree. A smaller percentage, 6 respondents (9.1%), had a PhD. This indicates a highly educated group of participants, with nearly half holding postgraduate degrees.

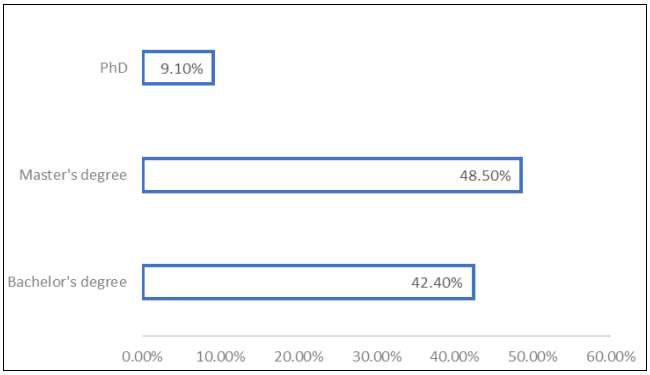

Fig 3: Participant's education background

4.2 Risk involved in project procurement option

Cost Overruns: Cost overruns represented a significant challenge in construction project procurement, as 69.7% of respondents reported frequently encountering these risks, with 27.3% indicating they always experience them. The high prevalence of cost overrun issues suggests that they are a common obstacle to project budgeting and financial planning. A Chi-Square analysis between cost overrun risks and participants' educational backgrounds reveals a statistically significant relationship (Pearson Chi-Square = 25.109, $p < 0.001$). This finding suggests that educational level may influence how participants perceive and handle cost overrun risks, with different educational backgrounds potentially affecting awareness, preparation, and management strategies for mitigating these challenges.

The majority of respondents (69.7%) encounter risks related to cost overruns often, with 27.3% indicating they always face such risks. Only 1.5% encounter these risks rarely or sometimes.

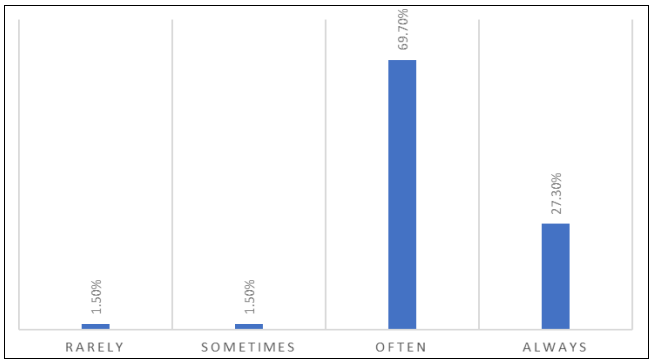

Fig 4: Risks Related to Cost Overruns

Based on the Chi-Square analysis of participant responses regarding the relationship between risks related to cost overruns and participants' educational backgrounds, the results indicate a significant association.

Table 2: Relationship between risks related to cost overruns and participants' educational backgrounds

Chi-Square Tests			
	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	25.109[a]	6	.000
Likelihood Ratio	32.448	6	.000
Linear-by-Linear Association	12.066	1	.001
N of Valid Cases	66		
a. 10 cells (83.3%) have expected count less than 5. The minimum expected count is .09.			

The Pearson Chi-Square value is 25.109, with a corresponding p-value of .000, which is below the conventional threshold of 0.05. This suggests that there is a statistically significant relationship between the two variables.

Table 3: Relationship between risks related to cost overruns and participants' educational backgrounds

		Occurrence of Risks Related to Cost Overruns				Total
		Rarely	Sometimes	Often	Always	
Education	Bachelor's degree	1	1	26	0	28
	Master's degree	0	0	14	18	32
	PhD	0	0	6	0	6
Total		1	1	46	18	66

Supplier failure was considered "very significant" by 37.9% of respondents and "extremely significant" by 36.4%, making it a critical issue in procurement decisions for many.

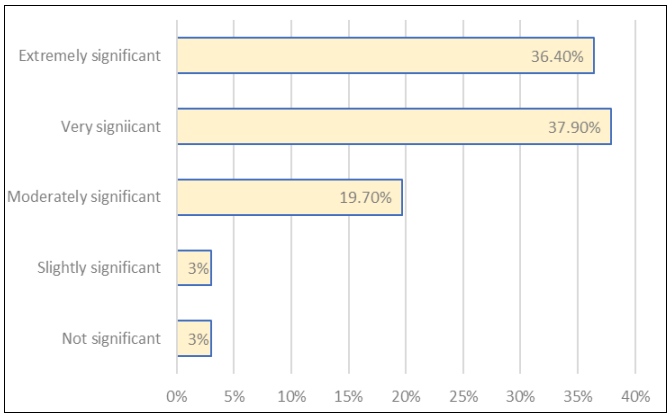

Fig 5: Supplier Failure Risks

The Chi-Square analysis between "Risks Related to Cost Overruns" and "Supplier Failure Risks" reveals a statistically significant association. This result implied that the distribution of risk categories is not independent, and there is a strong correlation between cost overruns and supplier failure risks. Additionally, the likelihood ratio test further supports this conclusion with a value of 54.306 and a p-value of .000.

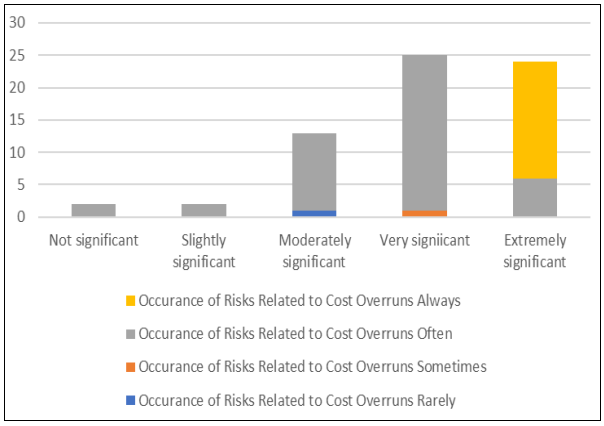

Fig 6: Chi-Square Analysis of the Association Between Risks Related to Cost Overruns and Supplier Failure Risks

4.3 Analyze How Risks are Managed in Project Procurement Options

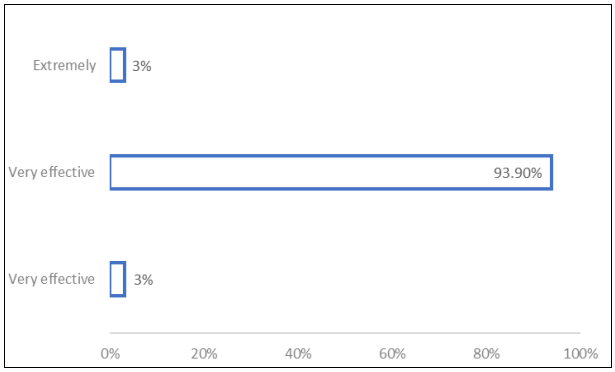

Fig 7: Effectiveness of Risk Management Strategies

Risk assessment tools are widely utilized, with 93.9% of respondents reporting they use them "often" in procurement processes, while a few (3%) use them "sometimes" or "always."

Table 4: Use of Risk Assessment Tools

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Sometimes	2	3.0	3.0	3.0
	Often	62	93.9	93.9	97.0
	Always	2	3.0	3.0	100.0
	Total	66	100.0	100.0	

The importance of training is notable, with 72.7% considering it "moderately significant" and 27.3% seeing it as "very significant" to their procurement risk management.

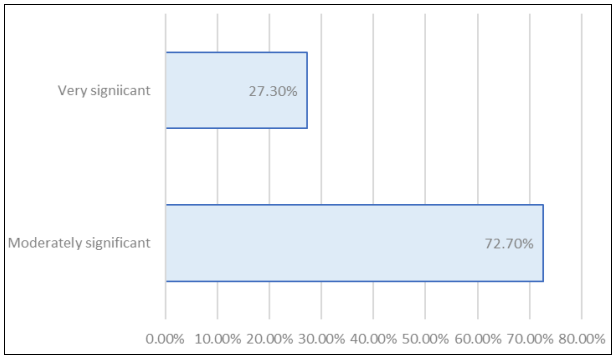

Fig 7: Role of Risk Management Training

Supplier audits are common, with 66.7% conducting them "always" and 27.3% "often," highlighting the importance of audits in mitigating procurement risks.

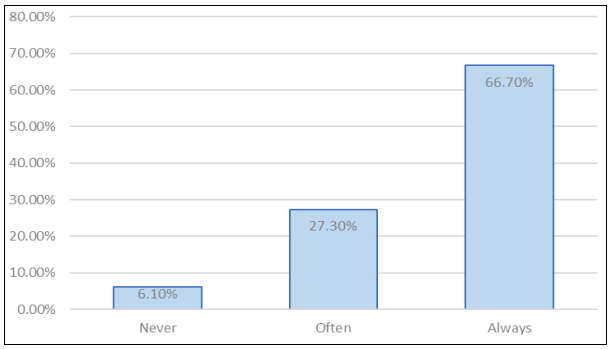

Fig 8: Supplier Audits

All respondents (100%) agreed that communication with suppliers is "very effective" in managing procurement risks.

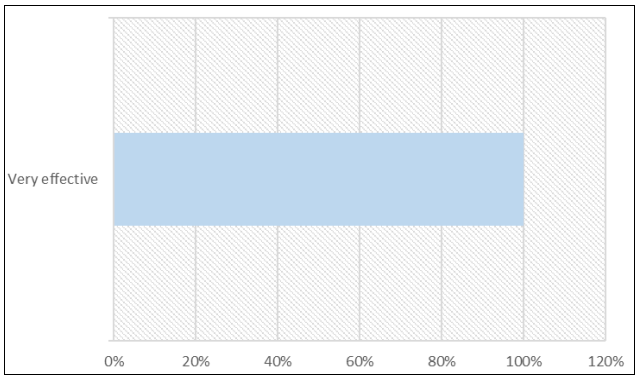

Fig 9: Communication with Suppliers

Most respondents (93.9%) revise their risk management plans "rarely," indicating minimal updates, while a few (3%) revise them "sometimes" or "often."

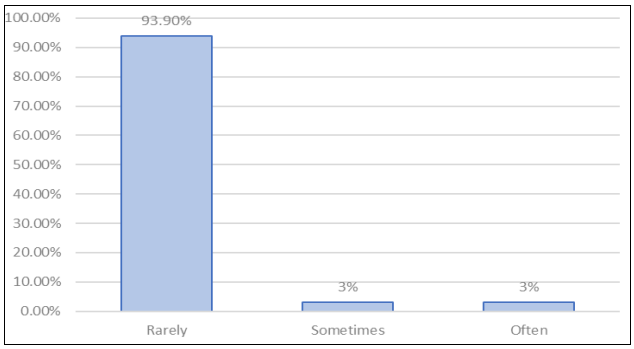

Fig 10: Revision of Risk Management Plans

Insurance is used extensively, with 78.8% utilizing it "to a great extent" and 18.2% "to a very great extent" as a risk management strategy.

Table 5: Use of Insurance

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	To a moderate	2	3.0	3.0	3.0
	To a great extent	52	78.8	78.8	81.8
	To a very great extent	12	18.2	18.2	100.0
	Total	66	100.0	100.0	

Technology plays a critical role in procurement risk management, with 78.8% stating it is "very significant" and 18.2% considering it "extremely significant."

4.3.1 Level of Awareness of Risk in Procurement Among the Project Members

Table 6: Awareness of Common Procurement Risks:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Moderately aware	4	6.1	6.1	6.1
	Very aware	6	9.1	9.1	15.2
	Extremely	56	84.8	84.8	100.0
	Total	66	100.0	100.0	

Risk awareness workshops or training sessions are "rarely" conducted for 75.8% of respondents, while 21.2% report they are held "often," and a small percentage (3%) attend them "sometimes."

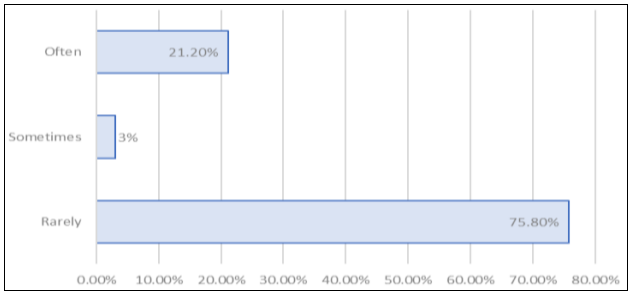

Fig 11: Frequency of Risk Awareness Workshops

Most respondents (66.7%) view the impact of procurement risks as "very significant" on project outcomes, 30.3% consider it "moderately significant." and 3% view it as slightly significant.

Table 7: Impact of Procurement Risks on Project Outcomes

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Slightly significant	2	3.0	3.0	3.0
	Moderately significant	20	30.3	30.3	33.3
	Very signiicant	44	66.7	66.7	100.0
	Total	66	100.0	100.0	

A considerable number of respondents (72.7%) report that they understand the risk management policies of their organization "slightly well," while 18.2% claim they do not understand them "well" at all.

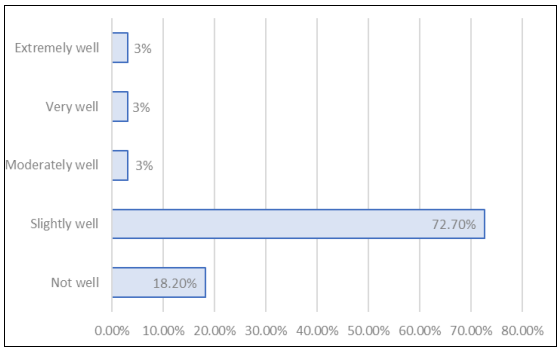

Fig 12: Understanding of Risk Management Policies

36.4% of respondents feel "very confident" in identifying potential procurement risks, and 21.2% are "extremely confident." However, 30.3% are only "slightly confident," and 9.1% are "not confident."

Table 8: Confidence in Identifying Procurement Risks

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not confident	6	9.1	9.1	9.1
	Slightly confident	20	30.3	30.3	39.4
	Moderately confident	2	3.0	3.0	42.4
	Very confident	24	36.4	36.4	78.8
	Extremely confident	14	21.2	21.2	100.0
	Total	66	100.0	100.0	

A notable portion (45.5%) of respondents "rarely" participate in risk assessment activities for procurement, while 36.4% "always" do so, and 18.2% "often" participate.

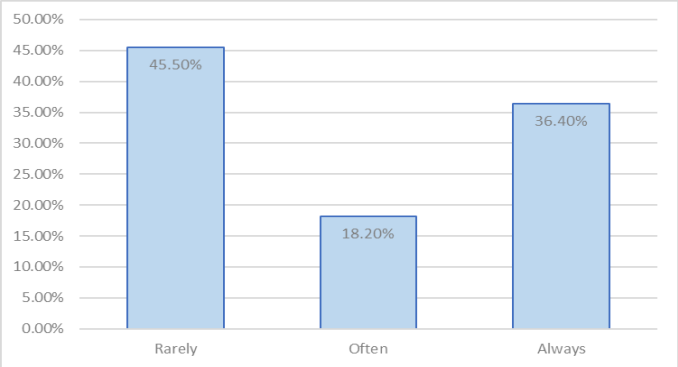

Fig 13: Participation in Risk Assessment Activities

The majority of respondents (86.4%) do not believe project members play a significant role in managing procurement risks, with only 12.1% finding their role "moderately significant."

Table 9: Role of Project Members in Managing Procurement Risks

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not significant	57	86.4	86.4	86.4
	Slightly significant	1	1.5	1.5	87.9
	Moderately significant	8	12.1	12.1	100.0
	Total	66	100.0	100.0	

Most respondents feel their team handles procurement-related issues "very well" (63.6%), with 33.3% stating they handle them "extremely well."

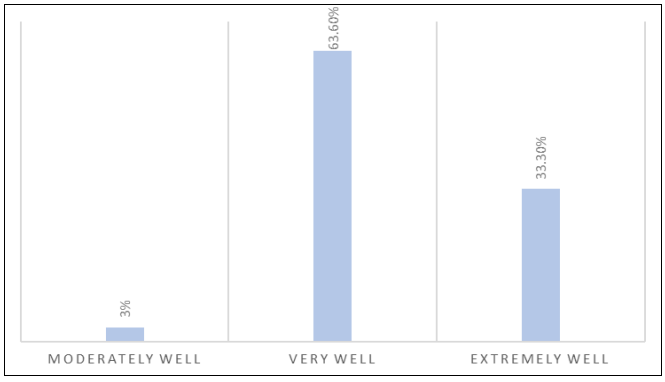

Fig 14: Handling of Procurement-Related Issues

Communication regarding changes in procurement risk management strategies is lacking, with 36.4% reporting they are "never" informed, 33.3% stating they are "rarely" informed, and 27.3% indicating they are "often" informed.

Table 10: Communication about Changes in Procurement Risk Strategies

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	24	36.4	36.4	36.4
	Rarely	22	33.3	33.3	69.7
	Sometimes	2	3.0	3.0	72.7
	Often	18	27.3	27.3	100.0
	Total	66	100.0	100.0	

4.4 Challenges faced in managing procurement risks

Participant's responses suggested that resource limitations are widely recognized as a barrier to risk management within procurement processes. However, a smaller portion of respondents, accounting for 18.2%, disagreed with the statement, indicating they may have access to sufficient resources or view resource constraints as a less critical factor in procurement risk management. This range of perspectives highlights the potential variability in resource availability across different teams or project contexts within the organization.

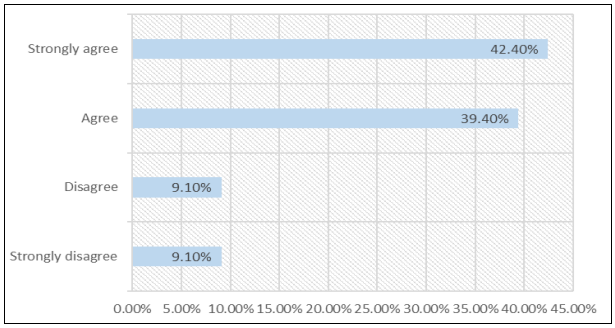

Fig 15: Impact of Resource Limitations on Procurement Risk Management

An overwhelming majority (81.8%) strongly agreed that training on procurement risk management is readily available, while the remaining 18.2% agreed. This indicates a consensus among respondents that the organization provides adequate training resources for risk management, suggesting strong institutional support in this area.

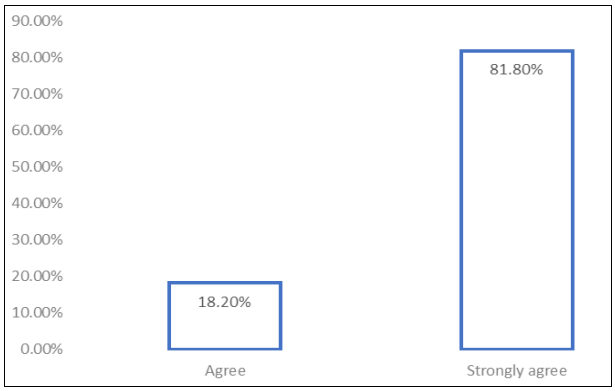

Fig 16: Availability of Training for Procurement Risk Management

Respondents unanimously indicated effective communication within teams regarding procurement risks, with 81.8% strongly agreeing and 18.2% agreeing. This uniform positive response implies that project teams experience clarity and effectiveness in procurement-related communications, facilitating smooth collaboration.

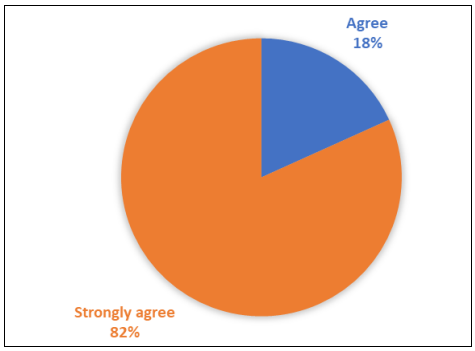

Fig 17: Effectiveness of Communication Regarding Procurement Risks

A significant proportion of participants (90.9%) agreed or strongly agreed that complex procurement policies pose challenges, with 63.6% agreeing and 27.3% strongly agreeing. Only 9.1% remained neutral, underscoring that the majority find policy intricacies to be an obstacle in effective risk management.

4.5 Discussion of respondents

The construction of the Chinsali-Nakonde road is a vital infrastructure project aimed at enhancing connectivity in Zambia. However, like many large-scale construction projects, it is fraught with various procurement risks that can significantly affect its success. These risks encompass cost overruns, supplier failures, quality issues, regulatory compliance challenges, and material availability. This discussion synthesizes key findings from the current study on procurement risks and contrasts them with relevant literature, providing a comprehensive analysis of procurement risks in the construction of the Chinsali-Nakonde road.

5. General Overview of the study

Finally, the chapter highlights the conclusions and recommendations after taking into account the research findings.

5.1 Conclusion

The study highlighted several critical insights regarding the impact of quality control measures on project outcomes within construction companies. The findings indicated that cost overruns are a prevalent challenge, affecting 69.7% of respondents often, with a statistically significant association found between these overruns and the educational background of project members. Supplier failure emerged as a major concern, deemed "very significant" by nearly 38% of respondents, further corroborating the strong relationship between cost overruns and supplier-related risks. Despite most respondents experiencing limited supplier delays, a notable number reported that supplier financial stability is a crucial factor influencing procurement success. Effective quality control measures were recognized by 66.7% of respondents as consistently contributing to project success.

5.2 Recommendations

Enhance Risk Management Training

Enhancing risk management training is crucial for improving project outcomes in the construction industry (Narayana & Heaumen 2021) [37]. Regular training sessions should be organized for project managers and team members, focusing on risk management best practices and the organization's specific policies. These sessions can provide comprehensive insights into identifying, assessing, and mitigating risks associated with procurement, a critical area often prone to challenges that lead to cost overruns.

Strengthen Supplier Relationships

Strengthening supplier relationships is essential for ensuring the success of construction projects, as suppliers play a crucial role in the supply chain (Costa 2019) [10]. To foster robust partnerships, organizations should implement performance evaluation criteria that assess suppliers based on key metrics such as delivery timelines, quality standards, and responsiveness. By establishing clear expectations and benchmarks, project managers can ensure that suppliers are aligned with the project's goals and can meet the required standards consistently.

6. References

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