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An Assessment of the Effects of Procurement Management on Project Performance at the Lusaka Water Supply and Sanitation Company (LWSC)

Maybin Chipili, Chikusela Sikazwe, Erastus Mwanaumo

Department of Business and Economics, School of Business, University of Zambia, Lusaka, Zambia
Email: maybin.chipili@gmail.com

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Abstract

The role of effective procurement management in enhancing project performance is crucial, particularly within the context of Lusaka Water and Sanitation Company (LWSC). Despite the implementation of various projects aimed at improving water supply and sanitation, empirical evidence on the effect of procurement practices remains limited. This study assessed the effects of procurement management on project performance at LWSC. A correlational research design with a quantitative approach was employed. Data were collected through structured electronic questionnaires distributed among the procurement and project management teams at LWSC. The sample size was determined using Slovin's formula, resulting in 60 respondents from a total population of 70. Data analysis was conducted using SPSS Version 22. The results showed that contract management positively influenced project performance (B = 0.084, β = −0.211, t = −1.441, $p = 0.156$), though this effect was not statistically significant. Inventory management also had a positive, but non-significant, relationship with project performance (B = 0.106, β = 0.239, t = 1.603, $p = 0.116$). In contrast, risk management demonstrated a significant negative effect on project performance (B = −0.290, β = −0.332, t = −2.020, $p = 0.049$). Based on these findings, the study recommends that LWSC strengthen training sessions for procurement managers, project managers, and team members on effective risk management practices to enable them to proactively identify, assess, and mitigate risks that could negatively impact project outcomes.

Keywords

Contract Management, Inventory Management, Risk Management

1. Introduction

In Zambia, procurement management began in 1969 with the establishment of the Public Finance (Control and Management Act). In 1992, the Zambia National Tender Board (ZNTB) was created to regulate public procurement. The board implemented several reforms under the Financial and Legal Management Upgrading Programme (FILMUP), financed by the International Development Association (IDA). FILMUP focused on strengthening ZNTB's administrative capacity, decentralizing procurement, and improving procurement procedures (Sipalo, 2021). Subsequent reforms were carried out under the Public Sector Capacity Building Project (PSCAP), also funded by IDA. In 2008, the Public Procurement Act established the Zambia Public Procurement Authority, marking further institutional strengthening. Procurement is now a crucial economic function in Zambia, contributing an estimated 15% of GDP. The role of procurement has expanded beyond regulatory functions to include strategic collaboration with suppliers, fostering competitive advantage for businesses (Sipalo, 2021).

This study was conducted at Lusaka Water and Sanitation Company (LWSC) in Lusaka. It was established in 1988 and operational by 1990. Lusaka Water and Sanitation Company (LWSC) is the water and sanitation utility for Lusaka Province. It is tasked with delivering sustainable water and sanitation services to the region. The sewerage network of LWSC covers approximately 30% of the city's area and is accessible to only 10% - 20% of the population (LWSC, 2023a). The company operates a 480 km-long sewage conveyance system, including pumping stations, wastewater treatment plants (WWTP), and stabilization ponds. LWSC has implemented several key projects aimed at improving water and sanitation access across Lusaka Province (LWSC, 2023a).

One such project is the Lusaka Sanitation Project, which aims to enhance access to sanitation services in specific areas of Lusaka while strengthening LWSC's capacity to manage these services. The project is divided into three components: (1) sewerage improvements, (2) on-site sanitation, and (3) institutional strengthening. The first component focuses on upgrading and expanding sewerage systems in priority areas, based on LWSC's Lusaka Sanitation Master Plan (LWSC, 2023b). The second component addresses on-site sanitation in peri-urban areas that are not expected to be connected to the sewer network in the near future due to financial and technical limitations. The third component provides technical assistance to LWSC to ensure sustainable operation and maintenance of the new facilities (LWSC, 2023b).

The Chongwe Water Supply Improvement Project addresses water shortages in Chongwe, especially during the dry season when the Chongwe River, the primary water source, dries up. This government-funded project, implemented through the Ministry of Local Government and Housing, developed an alternative water source in the Chalimbana area to supplement Chongwe's surface water supply (LWSC, 2023c). However, the Manzi ndi Umoyo Project, funded by The Coca-Cola Africa Foundation, focuses on providing clean and safe drinking water to the

communities of Bauleni and Chainda (LWSC, 2023d). Similarly, the Kabanana Water Supply Project, funded by the Devolution Trust Fund, seeks to address erratic water supply in Kabanana by rehabilitating its tank and installing a new 2 km water distribution network (LWSC, 2023e). Another notable initiative is the Kalingalinga SanMark Project, which is focused on connecting a peri-urban area to a sewer network using a condominial approach. This project involves constructing a new sewer network, while households build their own toilets and connect to the system. The project is being implemented in phases and is expected to benefit approximately 48,000 people upon completion (LWSC, 2023f).

1.1. Problem Statement

Lusaka Water and Sanitation Company experiences a number of procurement challenges which include: procuring goods and services for the project at exorbitant prices above the market value, implying that despite adhering to the correct procurement procedure in accordance with the law, goods and services are being procured at highly inflated prices which do not reflect value for money. Consequently, the inflation of prices by suppliers deprives the financial resources which could be directed to other projects and programs that require resources (Consumer Unity & Trust Society, 2021). As a result, there is a growing dissatisfaction among stakeholders about poor procurement management leading to poor contract management and subsequently escalating project costs, delay in project completion period and inconsistent quality of water and sanitation projects implemented by LWSC. Key projects, such as the Lusaka Sanitation Project, Chongwe Water Supply Improvement Project, Manzi ndi Umoyo, Kabanana Water Supply Project, and the Kalingalinga SanMark project, have not met stakeholder expectations in terms of timely delivery, cost management, and quality of service. The inability to consistently meet these expectations has raised questions regarding the effectiveness of procurement management practices in ensuring the success of these initiatives.

Furthermore, there is little empirical evidence on the effects of procurement management on the performance of these projects. For example, a study conducted by Zulu (2020) at Cavendish University Zambia analyzed procurement management practices and their impact on the success of construction projects using the Road Development Agency as a case study. However, the study did not fully meet its objectives and left critical gaps in understanding the role of procurement management in enhancing project performance, particularly within the context of water and sanitation projects. The failure to address these issues could hinder the organization's ability to deliver essential services efficiently, ultimately affecting the communities that depend on them. To address gaps left by the previous scholars, this study will ensure that the role of procurement management in enhancing project performance is well understood. Therefore, this study aims to assess the effects of procurement management on project performance at the Lusaka Water and Sanitation Company.

1.2. Hypotheses

1) Null Hypothesis (H0): Contract management has no significant effect on project performance at the Lusaka Water and Sanitation Company.

Alternative Hypothesis (H1): Contract management has a significant positive effect on project performance at the Lusaka Water and Sanitation Company.

2) Null Hypothesis (H0): Inventory management has no significant positive effect on project performance at Lusaka Water and Sanitation Company.

Alternative Hypothesis (H1): Inventory management has a significant positive effect on project performance at Lusaka Water and Sanitation Company.

3) Null Hypothesis (H0): Risk mitigation has no significant positive effect on project performance at Lusaka Water and Sanitation Company.

Alternative Hypothesis (H1): Risk mitigation has a significant positive effect on project performance at Lusaka Water and Sanitation Company.

2. Literature Review

In India, Kanchana et al. (2018) found that contract life cycle management is an effective tool to manage risks, compliance and change. The relationship between contractors monitoring and performance of national road infrastructure projects and the relationship between contractor monitoring components and performance of national road infrastructure projects was assessed in Uganda and suggested that if the contract monitoring components are well managed, there is a very high possibility of business success and effective service delivery. Relational contracting approaches have become more popular in recent years, and have appeared in common forms such as partnering, alliancing and relationship management contracts. Klijn et al. (2023) on the effect of contract- and network management on performance and innovation in infrastructure projects revealed that strict contract management (monitoring performance criteria and sticking to the contract) did not show a significant relationship to either the performance of, or innovation in, these projects. Network management (for example connecting involved parties and exploring new solutions), however, was significant, especially in terms of performance. In the interviews, practitioners highlighted that the complexity of these projects meant that a collaborative relationship between the public and private parties was essential to overcome unforeseen problems.

Nsanzimana & Mulyungi (2018) found a strong and positive relationship between management techniques and performance of Remera-Rwandex road construction project as their results of correlation between management techniques and project performance were at 0. 720 meaning that management techniques affect project performance at the level of 72% which proves a significant relationship between management techniques and performance of Rwandex-Remera road construction project. Maina and Osoro (2020) revealed that contract planning have broadly impacted on organizational performance of telecommunication sectors in Kenya. The findings concluded that modern institutions should drive to embrace the best contract planning, contract administration, and dispute resolu-

tion on organizational performance in telecommunication sector in Kenya. Eyaa and Ntayi (2010) revealed that the components explained 19.4% of the variance in supply chain performance, purchasing risk taking was a significant predictor of supply chain performance while purchasing knowledge and skills and strategic purchasing were not.

Mgabo (2020) showed that the majority of respondents showed that the award of the tender was award process is not undertaken within reasonable time, implying that there are unnecessary delays, from the time of tender announcement to award. It was also indicated that the majority of the respondents highlighted the fact that disappointment to get it the contract documentation leads to misinterpretation of contractual terms, with 75% of the respondents showing that the experience of the contractor in the construction industry is very critical to project performance. The study also found that all the four independent variables, which are compliance, monitoring, documentation and technical capacity, all have statistically significant effects on project performance.

Nsefu et al. (2020) found various challenges affecting the success of contract management. There was also a relationship between a balanced scorecard and contract management performance. The study developed a framework that could be used for the implementation of a balanced scorecard in bringing about improved contract management performance. Kafula et al. (2023) revealed a strong adherence to pre-award practices but varying levels of adherence to the post award practices. Sahari et al. (2012) revealed that inventory management is positively correlated with firm performance. The study also revealed that there is a positive relationship between inventory management and capital intensity. The study was conducted in a construction firm. There was a need to conduct a study specifically in the context of Lusaka Water and Sanitation Company.

Mahyadin et al. (2015) revealed challenges of loss of medicines. It also showed that the situation was critical and needed proper Inventory Management practices to control it. The study further revealed that the medicines or drugs was not properly controlled and lead to excess of stock. In addition, this excess of stock or surplus of stock lead to the reduction in the number of drugs ready to serve to the patients. Reviewing a study on the influence of inventory management practices towards inventory management performance is beneficial as it reveals challenges of loss of medicines and medicines not being controlled and resulting into excess stock. The results shows how lack of proper inventory management at any organization could lead to theft and excess stock. Mohamad et al. (2016) revealed that companies had a few inventory problems such as unorganized inventory arrangement, large amount of inventory and no accurate recording balance due to unskilled workers. The study also provided that there was a significant relationship between return on asset (ROA) and inventory days.

Shin et al. (2015) found that a lower ratio of inventory to sales for a firm is associated with higher profit margin for the firm. In addition, small size firms can receive a larger benefit (as measured by profitability) from increased inventory

efficiency when compared to medium and large size firms. Mat and Kadir (2017) found that all the variables (inventory management system practices, technical knowledge, and supply chain management practice and information technology) did not determine the level of inventory management system performance. This was due to many obstacles and problems toward SMEs' inventory management system practices. This study was relevant to the study. However, the study did not show the relationship that existed between inventory management and an independent variable. As a result, this study considered showing the correlation that existed between the independent and dependent variable using Spearson' correlation coefficient. Ahmad and Zabri (2020) reported that most responding enterprises have adopted both unsystematic and systematic inventory management approaches in their business. A fully systematic approach of inventory management was only utilized by 33 per cent of the total respondents. In terms of inventory management techniques used, 'the rule of thumb' was the most popular among respondents. Meanwhile, EOQ, Bar Code Tagging and VMI were applied by a small number of respondents. The results also indicated that Purchasing and Controlling were the most frequent inventory management activities applied by micro enterprises as opposed to Storage and Tracing. Finally, the results established that owner/managers' attitude and knowledge in inventory management have significant and positive influences on inventory management practices. On the other hand, the cost factor has a significant and negative influence on inventory management practices. Karim et al. (2018) revealed that a company practices risk inventory management in keeping stock as it relies heavily on third part warehousing service beyond the control of the company. The study also revealed that the standard operating procedures are too general and lack specificity. However, the study concluded that poor inventory management has a modest influence on the financial performance of the company.

Aputo (2019) indicated that need assessment, supplier sourcing, contract management and inventory management all have an effect on Project Performance. Upon conducting hypothesis tests, all these functions were found to have a statistically significant effect on project performance. The study also found R-Square of 0.395 which implies that 39.5% of the independent variable, which were inventory management, supplier sourcing process, need assessment, contract management explained project performance. It also found a statistically significant F calculated value of 4.303 as indicated by a p value of $p = 0.004 > 0.05$. The study therefore concluded that procurement management practices such as need assessment, supplier sourcing; contract management and inventory management have a positive effect on project performance. Naluyima (2016) conducted research on the effects of procurement management on project performance at Uganda Millennium Science Initiative Project which found that the variables defining procurement planning ($r = 0.349$, $N = 57$, $p = 0.008$), solicitation ($r = 0.273$, $N = 57$, $p = 0.040$), and contract management ($r = 0.077$, $N = 57$, $p = 0.005$) had a significant effect on project performance.

Kaudunde (2013) found that during 2011/2012 financial year, there was one facility, one balance and no new facility. The study revealed that Kilwa district council has improved all inventory control systems through operating activities at a minimum cost. Chalotra (2013) revealed that stock management is identified as an essential tool in enhancing asset productivity and inventory turns, concentrated on customers and positioning merchandise in various markets, improving intra and inter-organizational networks, enriching technological abilities to produce pleasant merchandise thereby presenting effectiveness in inter-company relationships, right inventory control even effects in enhancing aggressive capacity and market percentage of small manufacturing devices. Mwangi (2017) revealed that most of the operations within the sugar firms are based on trust. In addition, the study concluded that the sector is not highly efficient in managing all its operational undertaking. Oballah et al., (2015) revealed that inventory investment and inventory records accuracy have a positive influence on organizational performance while inventory shrinkage have a negative effect on organizational performance of Kenyatta National hospital. Oballa et al.'s (2015) study recommends that the hospital should ensure that losses resulting to inventory shrinkage related to medicines are reduced. Zulu (2020) found that Procurement Management practices currently in operation contribute to operational efficiency despite challenges of delay in project completion period.

The study revealed also that Procurement Management Practices has potential to effectively contribute to the success of construction projects despite some challenges in designing procurement strategies such as E-procurement, evaluation and monitoring programs to meet the overall operational objectives and efficiency. Leung et al. (2016) found that almost no stock-out of AL products were observed during Q4 2009 consistent with primary analysis. The study observed that up to 30% of surveyed facilities stocked out of some AL product during Q1 2010 despite ample inventory being simultaneously available at the national warehouse. It was observed that simulation experiments closely reproduced these results and linked them to use of average past monthly issues and failure to capture lead-time variability in current inventory control policies.

In Malaysia, Ravichandran et al., (2024) found that risk mitigation ($\beta = 0.45$, $p < 0.01$) and project management tools ($\beta = 0.38$, $p < 0.01$) have a significant positive impact on organizational performance. However, effective communication ($\beta = 0.12$, $p > 0.05$) and project planning ($\beta = 0.15$, $p > 0.05$) did not show statistical significance. These, results suggest that while communication and planning are important, the effective utilization of risk mitigation strategies and the adoption of advanced project management tools are crucial for enhancing performance outcomes. Managers should prioritize these areas to maximize organizational performance. Noori (2021) found that Malaysian banks have implemented or are in the midst of implementing mechanisms for economic capital calculation for major risks such as credit risk, market risk, operational risk, and liquidity risk. Credit risk is among the biggest chance that banks confront. Credit risk emerges due to

bank borrowers may not be able to fulfill their legally binding commitments. This concept and the highlights of a sound credit risk management handle are examined within Basel II. The most objective of the system is to assist fortify the soundness and solidness of the worldwide banking system by means of superior risk management, by bringing administrative capital prerequisites more in line with current bank great hones. The establishment of credit risk management is the establishment of a system that characterizes corporate priorities, loan approval process, and credit risk rating system; risk-adjusted pricing system, loan-review mechanism, and comprehensive reporting system. The credit chance administration work has extended its center to incorporate both guarantor and counterparty chance as a result of a write-down (losses) in their investment and trading portfolios. Stress testing becomes an essential method that exams the elasticity of the banking institutions vis-à-vis adverse economic and market conditions. It is a tool to take measures to cope with possible events. Stress testing credit risk is an essential element of the Basel II framework.

In Kenya, Ngare & Wairimu (2024) found that risk transfer has a significant effect on project performance of commercial banks in Nairobi City County, Kenya. The study also concluded that risk prevention has a significant effect on project performance of commercial banks in Nairobi City County in Kenya.

3. Methodology

3.1. Research Design

The research study adopted correlational research design. Correlational research is a type of non-experimental research method in which a researcher measures two variables and understands and assesses the statistical relationship between them with no influence from any extraneous variable. In statistical analysis, distinguishing between categorical data and numerical data is essential, as categorical data involves distinct categories or labels, while numerical data consists of measurable quantities (Curtis et al., 2016). The design was appropriate for hypothesis testing because it enabled the researcher to assess the statistical relationship between the independent and dependent variables without manipulating them. It was also adopted because a correlational research study occurs in real-life situations, the data that gets gathered from this work is typically more applicable to everyday encounters. Further, the variables that get studied with correlational research help to find the direction and strength of each relationship (Curtis et al., 2016).

3.2. Time Horizon

The study adopted cross-sectional study. A cross-sectional study is a type of research design in which a researcher collects data from many different individuals at a single point in time. In cross-sectional research, the researcher observes variables without influencing them. It is adopted because it allowed to collect a great deal of information quickly. Data was obtained inexpensively using self-report

questionnaires. In addition, it helped the researcher to amass large amounts of information from a large pool of participants. Unlike longitudinal studies, cross-sectional studies do not follow individuals up over time. They are usually inexpensive and easy to conduct in a short period of time (Arrow et al., 2023).

3.3. Study Population and Sampling Strategy

The study population was seventy (70) which consisted of the procurement team and project management team at Lusaka Water and Sanitation Company. This encompassed a diverse range of roles from senior management to operational staff directly engaged in procurement activities and project management activities. In addition, the criteria for selecting participants included their availability and willingness to participate in the study. The study employed a simple random sampling to ensure unbiased representation of employees from Lusaka Water and Sewerage Company. A comprehensive list of 70 employees from the project management and procurement department was obtained. The names of employees were replaced with a unique number. The numbers representing all 70 individuals was printed out and each number was cut into individual pieces of paper. Thereafter, all the pieces of paper with numbers were placed into a large bowl and the researcher thoroughly mixed the pieces to ensure random distribution. Further, the researcher randomly drew numbers from the bowl until the predetermined sample size was reached. This process ensured that every individual had an equal chance of being selected. In addition, the researcher created a table listing the selected numbers along with their corresponding names and contact information for easy reference and further communication.

In this study, the Slovin Formulae (the formula for sample size calculation for a finite population) was employed to determine the sample size for the study. This statistical technique considers factors such as desired effect size, significance level (typically set at 0.05), and statistical power (often set at 0.80 or higher). In addition, the required sample size was calculated to detect significant relationships or differences between variables related to stakeholder support and business analytics uptake. In addition, the sample size was determined based on the total population (70 employees). The sample size calculation incorporated adjustments for expected response rates and potential attrition during data collection. Furthermore, the selected sample size is crucial as it ensures adequate statistical power to detect meaningful relationships and patterns within the data. This robust sampling approach enhanced the study's credibility and applicability providing insights that can inform policy and practice in leveraging stakeholder support for effective project management. Below is the sample size calculation using Slovin Formulae.

$$n = N/(1 + N(e^2)$$

$$n = 70/(1 + (0.05^2)$$

$$n = 70/(1 + 70(0.0025)$$

$$n = 70/(1 + 0.175)$$

$$n = 70/(1.175)$$

$$n = 60$$

where: n = Sample Size; N = Total Population; e = Margin error (0.05).

3.4. Instruments

The study employed a structured questionnaire to collect quantitative data from employees at Lusaka Water and Sanitation Company (LWSC). The questionnaire measured four main constructs: contract management, inventory management, risk management, and project performance. Each construct was measured using multiple statements with a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). The use of Likert scales allowed respondents to indicate their level of agreement with statements related to LWSC's procurement and project management practices.

Contract Management

Contract management refers to the processes and procedures that companies may implement to manage the negotiation, execution, performance, modification, and termination of contracts with various parties including customers, vendors, distributors, contractors, and employees (Gutterman, 2023).

Sample Items on the Questionnaire:

- LWSC conducts invitation to and evaluation of bids.
- LWSC conducts awarding and implementation of contracts.
- LWSC monitors contract implementation.
- LWSC integrates essential contract modifications.
- LWSC approves and administers contract variations and modifications.
- LWSC cancels or terminates contracts.

Inventory Management

Inventory management is the practice overseeing and controlling of the ordering, storage and use of components that a company uses in the production of the items

It sells. It includes maintaining stock levels, planning material requirements, implementing Just-in-Time strategies, and tracking inventory storage (Odisha State Open University, 2017).

Sample Items on the Questionnaire:

- LWSC conducts vendor-managed inventory.
- LWSC conducts material requirement planning.
- LWSC implements Just-in-Time inventory practices.
- LWSC conducts storage and tracing of materials.

Risk Management

Risk management is the systematic process of identifying, assessing, and mitigating threats or uncertainties that can affect your organization. It involves analyzing risks' likelihood and impact, developing strategies to minimize harm, and monitoring measures' effectiveness (HBS Online, 2023).

Sample Items on the Questionnaire:

- LWSC conducts identification and assessment of risks.
- LWSC implements risk mitigation strategies.
- LWSC conducts evaluation and management of risks.

Project Performance

Project Performance is the overall measurement of whether a project has met objectives and requirements of scope, cost, and schedule. A periodic measurement during the monitoring and controlling phases of a project performed to observe project execution and identify variances from the Project Management Plan for proactive mitigation (United States Department of Energy, n.d.).

Sample Items on the Questionnaire:

Quality of cost has improved.

Productivity has increased.

Likert Scale for All Constructs:

1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.

3.5. Data Analysis

Data analysis is the process of systematically applying statistical and/or logical techniques to describe and illustrate, condense and recap, and evaluate data (George Town University, 2024). Therefore, all analyses were done using IBM SPSS Statistics 26 and data was analysed using descriptive and inferential statistical analysis methods which included multiple regression analysis and correlation analysis to examine relationships between variables.

4. Results and Discussion

In Table 1, the results showed that 61.7% (37) of the respondents were males while 38.3% (23) of the respondents were females. With regards to academic qualifications, the study revealed that 1.7% (1) of employees held certificates,

Table 1. Demographic characteristics.

Demographic Characteristics	Frequency	Percentage
Gender		
Male	37	61.7%
Female	23	38.3%
Academic Qualifications		
Certificate	1	1.7%
Diploma	23	38.3%
Undergraduate Degree	27	45.0%
Master's Degree	9	15.0%
Years of Experience		
6 - 10 Years	44	73.3%
11 - 15 Years	16	26.7%

38.3% (23) of employees held diplomas, 45.0% (27) of employees held Undergraduate Degrees, and 15.0% (9) of employees held Master's Degrees. With regards to years of experience, the study revealed that 73.3% (44) of the employees had 6 - 10 years of work experience while 26.7% (16) of the employees had 11 - 15 years of experience. The results clearly show that employees who participated in the study had substantial experience in procurement or project management.

Descriptive Statistics

Descriptive statistics were used to describe and summarize the data regarding the variables. The primary goal of descriptive statistics analysis was to calculate frequencies, mean, standard deviation, skewness, and kurtosis. Skewness shows a symmetrical distribution of data, while kurtosis provides information about the flatness of the data distribution (Pallant, 2016). In addition, skewness and kurtosis were used to assess the data for violations of normality. According to George and Mallery (2010) skewness and kurtosis values between +2/−2 provide evidence that there is no significant deviation from the normal univariate distribution of the data.

Table 2. Descriptive statistics for variables.

	SD	D	N	A	SA	Mean	Std. Deviation	Skewness	Kurtosis
Contract1	0	0	1	14	71.2	4.69	0.506	−1.322	0.757
Contract2	0	0	0	48.1	51.9	4.52	0.505	−0.079	−2.075
Contract3	0	0	0	38.5	61.5	4.62	0.491	−0.489	−1.833
Contract4	0	0	3.8	40.4	55.8	4.52	0.577	−0.714	−0.453
Contract5	0	0	0	19.2	80.8	4.81	0.398	−1.608	0.608
Contract6	0	0	0	38.5	61.5	4.62	0.491	−0.489	−1.833
Contract7	0	0	0	19.2	80.8	4.81	0.398	−1.608	0.608
Inventory1	0	0	0	40.4	59.6	4.6	0.495	−0.404	−1.912
Inventory2	0	0	0	7.7	92.3	4.92	0.269	−3.271	9.043
Inventory3	0	0	0	30.8	69.2	4.69	0.466	−0.858	−1.315
Inventory4	0	0	0	30.8	69.2	4.69	0.466	−0.858	−1.315
Risk1	0	0	0	1.9	98.1	4.98	0.139	−7.211	52
Risk2	0	0	0	21.2	78.8	4.79	0.412	−1.455	0.12
Risk3	0	0	0	13.5	86.5	4.87	0.345	−2.205	2.976
Project1	0	0	0	23.1	76.9	4.77	0.425	−1.316	−0.28
Project2	0	0	1.9	7.7	90.4	5.88	6.95	7.194	51.835

In Table 2, data were collected using a 1 - 5 Likert scale with 1—Strongly disagree, 2—Disagree, 3—Neither agree nor disagree, 4—Agree, and 5—Strongly agree. Thus, mean values significantly greater than 3.5 mean that, on average, respondents agreed/strongly agreed with the factor statement, while mean values significantly less than 2.5 means that, on average, respondents disagreed/strongly

disagreed with the factor statement. Mean values between 2.5 and 3.5 indicate that, on average, respondents neither agreed nor disagreed with the statement about the factor.

In Table 2, the mean values for all variables ranged between 4.52 and 4.98. This suggested that most responses were concentrated in the "Agree" to "Strongly Agree" categories, reflecting a high level of positive agreement among respondents. The standard deviations range from 0.139 to 0.577. This indicated relatively low dispersion and a consistent pattern in the responses. Skewness measures the symmetry of the distribution. Most variables exhibited negative skewness, with values ranging from −1.608 to −0.079, suggesting that the data is skewed to the left. This indicated that respondents tended to agree or strongly agree, with fewer responses on the disagreement side. Some variables, such as Contract5 and Contract7 (skewness of −1.608), had more pronounced negative skewness, showing even greater concentration of responses toward the higher end of the scale. Kurtosis values generally range from −2.075 to 1.976, which suggested that most variables had distributions that are not significantly flat or peaked compared to the normal distribution. Inventory2 (kurtosis of 1.043) and Risk3 (kurtosis of 1.976) displayed somewhat sharper peaks, indicating that responses were more tightly clustered around a particular point. It can therefore be concluded that the skewness and kurtosis values for the majority of variables are within acceptable ranges, indicating that the data does not deviate substantially from normality.

However, for contract management the mean values for the items/statement ranged from 4.52 to 4.81. This indicated that respondents generally agreed that LWSC conducts invitation to and evaluation of bids, awarding and implementation of contracts, measurement, and payment calculation, monitoring contract implementation, integrates essential contract modifications, approves and administer contract variations and modifications and cancels or terminate contracts with most responses concentrated in the "Agree" to "Strongly Agree" categories. This meant that contract management was perceived positively. This result was consistent with the findings of the study by Kafula et al. (2023) on contract management as a tool for successful project performance in construction projects in Zambia revealed a strong adherence to pre-award practices but varying levels of adherence to the post award practices. Similarly, research by Mgabo (2020) aligns with the current study's findings, as LWSC's ability to administer contracts effectively is likely to foster satisfaction among stakeholders, thereby enhancing overall project performance. The findings of this study are also in agreement with the findings of the study by Maina and Osoro (2020) which revealed that contract planning have broadly impacted on organizational performance of telecommunication sectors in Kenya. The findings concluded that modern institutions should drive to embrace the best contract planning, contract administration, and dispute resolution on organizational performance in telecommunication sector in Kenya. This is reflected in LWSC's approach to contract management, where the system-

atic evaluation and implementation of contracts lead to positive project outcomes. This reinforces the notion that LWSC's contract management practices likely contribute to improved project performance metrics.

However, the study showed that the inventory mean values varied from 4.60 to 4.92. This demonstrated a strong positive agreement among respondents about inventory management practices. In addition, this indicated that majority of the respondents generally agreed that LWSC conducts vendor managed inventory, material requirement planning, conducts Just-in-Time, and storage and tracing. This result was consistent with the findings of the study by Sahari et al. (2012) in Malaysian construction firms which revealed that inventory management is positively correlated with firm performance. Similarly, research by Oballah et al., (2015) revealed that inventory investment and inventory records accuracy have a positive influence on organizational performance while inventory shrinkage have a negative effect on organizational performance of Kenyatta National hospital. These alignments suggest that LWSC's systematic approach to inventory management positively influences project performance metrics. Furthermore, the findings of this study are also in agreement with the work of Mohamad et al. (2016) which revealed that companies had a few inventory problems such as unorganized inventory arrangement, large amount of inventory and no accurate recording balance due to unskilled workers. The study also provided that there was a significant relationship between return on asset (ROA) and inventory days. This reinforces the notion that LWSC's inventory management efforts likely play a crucial role in fostering positive project performance. In addition, research by Nuhu (2025) in the food supply chain sector in Bangladesh highlighted the importance of effective inventory control in reducing operational costs and enhancing customer satisfaction. This further supports the positive perceptions observed at LWSC regarding its inventory management practices and their impact on project performance.

However, study found that the mean ranged of 4.79 to 4.98. This indicated that majority of the respondents generally agreed that LWSC conducts identification and assessment of risk, implements risk mitigation strategies and conducts evaluation and management of risks. In addition, the higher mean values suggested that respondents felt very positively about the organization's risk management efforts. However, the results revealed that, the hypothesis "risk mitigation has a significant negative effect on the performance of projects implemented at Lusaka Water and Sanitation Company" was not supported. This result was inconsistent with the findings of the study by Ravichandran et al., (2024) on the impact of risk mitigation and project management tools on organizational performance in Malaysia which found that risk mitigation ($\beta = 0.45$, $p < 0.01$) and project management tools ($\beta = 0.38$, $p < 0.01$) have a significant positive impact on organizational performance. Similarly, research by Aduma & Kimutai (2018) in Kenya reported that the risk management practices; legal construction risk and management, contract risk management were found to have an inverse relationship with the construction project performance while design risk management had a positive one. However,

the results of this study imply that the specific risk mitigation strategies employed by LWSC may require further evaluation to understand their impact on project performance fully. Furthermore, findings Ngare & Wairimu (2024) found that risk transfer has a significant effect on project performance of commercial banks in Nairobi City County, Kenya. The study also concluded that risk prevention has a significant effect on project performance of commercial banks in Nairobi City County in Kenya.

Principal Component Analysis

Principal component analysis is a statistical technique used to reduce the dimensionality of a dataset while preserving as much variance as possible. It achieves this by transforming the original variables into a new set of uncorrelated variables, called principal components. These components are linear combinations of the original variables and are ordered so that the first component explains the maximum variance in the data, the second component explains the second most variance, and so on. Principal component analysis (PCA) is widely used in various fields such as image processing, finance, biology, and social sciences to simplify complex data sets and to identify patterns and relationships between variables. It is particularly useful when dealing with large datasets with many variables, as it helps in visualizing and interpreting data more effectively (IBM, 2024). Principal component analysis was used to reduce the indicators to components that are easy to interpret. In order to conduct a principal component analysis, the following assumptions were evaluated:

Assumption 1: There are multiple variables measured at the continuous level (ordinal data is also considered). The questionnaire had 16 statements that measured four constructs at the ordinal level of measurement (strongly disagree, disagree, neutral, agree and strongly agree).

Assumption 2: There should be a linear relationship between all variables. This was tested using the correlation matrix. The level of correlation considered worthy of a variable's inclusion is usually $r \geq 0.3$ (Laerd Statistics, 2018). In this data set, all the variables had correlations greater than 0.3.

Assumption 3: There should be a large sample size—10 cases per variable was a rule of thumb used to determine this assumption (Tabachnick and Fidell, 2014). There were 16 variables that met the minimum factor loading of 0.6; using the rule of thumb of 10 cases per variable (Tabachnick & Fidell, 2014), a minimum of 160 cases would be recommended. However, the actual sample for this study consisted of 60 respondents. While the sample is smaller than the recommended guideline, all variables were retained, and caution is noted in interpreting the factor analysis results due to the limited sample size.

Sampling Adequacy

To test for the sampling adequacy, the data set was tested using the Kaiser-Meyer-Olkin (KMO) index (Kaiser, 1974). The Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity are statistical tools commonly used in the context of factor analysis to assess whether a dataset is suitable for this type of analysis.

The KMO measure evaluates the sampling adequacy of data for factor analysis and is calculated by considering the partial correlations between variables and then taking into account the sum of these correlations relative to the sum of all correlations. The KMO index ranges from 0 to 1 Higher values close to 1 indicate that the variables in the dataset are suitable for factor analysis. Lower values closer to 0 suggest that correlations between variables are too weak for reliable factor analysis. On the other hand, Bartlett's test evaluates whether the correlation matrix among variables is an identity matrix, which would indicate that variables are not correlated and hence not suitable for factor analysis. The null hypothesis for Bartlett's test is that the correlation matrix is an identity matrix (variables are uncorrelated). If Bartlett's test yields a significant result (typically $p < 0.05$), then the null hypothesis is rejected, indicating that correlations between variables are sufficiently large for factor analysis thus, a non-significant result suggests that the dataset does not have sufficient correlations among variables for meaningful factor analysis. For this data, the KMO is 0.620 which is satisfactory (Kaiser, 1974). For the individual items KMO measures, all were above 0.6. The Bartlett's test of sphericity is statistically significant (i.e., $p < 0.05$). Thus, the correlation matrix was not an identity matrix. This indicates that the data was suitable for principal components analysis. See Table 3 and Table 4 below.

Table 3. KMO and Bartlett's Test.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.620
Bartlett's Test of Sphericity	Approx. Chi-Square	333.869
	df	120
	Sig.	0.000

Table 4. KMO measures for individual variables.

Variable	KMO Measure	Variable	KMO Measure
Contract1	0.602	Inventory2	0.711
Contract2	0.613	Inventory3	0.701
Contract3	0.611	Inventory4	0.601
Contract4	0.703	Risk1	0.641
Contract5	0.622	Risk2	0.702
Contract6	0.724	Risk3	0.723
Contract7	0.623	Project1	0.633
Inventory1	0.623	Project2	0.721

The Result of the PCA

In Table 5, a principal component analysis (PCA) was run on a 16-question questionnaire that assessed effects of procurement management on project per-

formance at Lusaka Water and Sanitation Company. The suitability of PCA was assessed prior to analysis. Inspection of the correlation matrix showed that all 16 variables had at least one correlation coefficient greater than 0.3. The overall Kaiser-Meyer-Olkin (KMO) measure was 0.600, with individual KMO measures all greater than the minimum acceptable cut off of 0.6, according to Kaiser (1974). Bartlett's test of sphericity was statistically significant ($p < 0.0005$), indicating that the data was likely factorizable. PCA revealed four components that had eigenvalues greater than one and which explained 23.683%, 18.964%, 12.430%, and 8.425% of the total variance, respectively (see **Table 6** for outputs). Visual inspection of the scree plot indicated that four components should be retained (Cattell, 1966). In addition, a four-component solution met the interpretability criterion (see **Figure 1** for outputs). As such, four components were retained. The four components that were retained are Contract Management, Inventory Management, Risk Mitigation and Project Performance. The four-component solution explained 63.503% of the total variance. A Varimax orthogonal rotation was employed to aid interpretability. The rotated solution exhibited "simple structure" (Thurstone, 1947). The interpretation of the data was consistent with the attributes the questionnaire was designed to measure with strong loadings of contract management (1), inventory management (2), risk management (3), and project performance (4).

Table 5. Rotated structure matrix PCA with varimax rotation.

	Component				Communalities
	1	2	3	4	Extraction
Contract1	**0.317**	−0.024	0.503	−0.460	0.625
Contract2	**0.285**	0.583	0.249	−0.170	0.616
Contract3	**−0.**503	0.036	0.635	−0.036	0.742
Contract4	**−0.**076	−0.213	0.127	0.291	0.680
Contract5	**0.890**	−0.039	0.113	−0.031	0.706
Contract6	**−0.**384	0.634	0.088	0.113	0.852
Contract7	**0.890**	−0.039	0.113	−0.031	0.660
Inventory1	0.728	**0.450**	−0.281	0.227	0.710
Inventory2	−0.049	**0.753**	−0.462	−0.210	0.713
Inventory3	0.626	**0.479**	−0.098	0.414	0.600
Inventory4	−0.447	**0.627**	0.227	0.401	0.619
Risk1	−0.043	0.378	**−0.**388	−0.553	0.785
Risk2	−0.334	0.720	**−0.**004	−0.032	0.630
Risk3	−0.031	0.268	**0.621**	0.198	0.698
Project1	−0.249	−0.340	−0.512	**0.433**	0.627
Project2	0.564	0.045	0.265	**0.214**	0.636

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Table 6. Total variance explained.

Total Variance Explained									
C	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.789	23.683	23.683	3.789	23.683	23.683	3.339	20.869	20.869
2	3.034	18.964	42.648	3.034	18.964	42.648	2.914	18.210	39.079
3	1.989	12.430	55.078	1.989	12.430	55.078	1.959	12.245	51.324
4	1.348	8.425	63.503	1.348	8.425	63.503	1.949	12.179	63.503

Extraction Method: Principal Component Analysis.

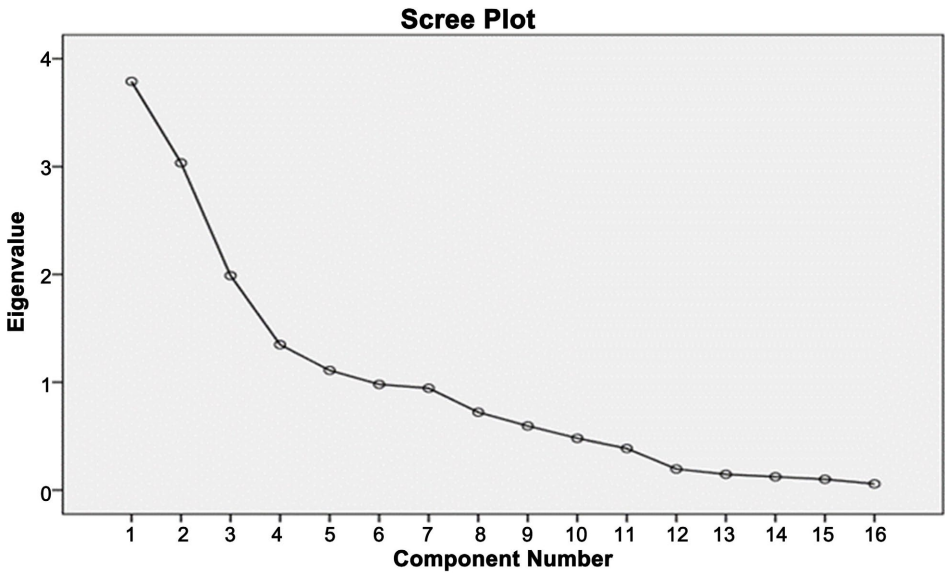

Figure 1. Scree plot.

Reliability Analysis

In this study, a structured questionnaire served as the primary tool for evaluating several distinct constructs relevant to the research objectives. The questionnaire was meticulously designed to capture key variables related to the effects of procurement management. This method ensured that the data collected was comprehensive and aligned with the study's aims. To ascertain the reliability of the constructs measured by the questionnaire, the researcher employed Statistical Package for Social Sciences (SPSS) version 22. This software facilitated a rigorous reliability analysis, specifically using Cronbach's alpha coefficient. Cronbach's alpha is a widely used measure to assess the internal consistency of a set of questionnaire items intended to measure a single construct. It quantifies how closely related a set of items are as a group, providing insights into the reliability and coherence of the constructs being studied. Table below in the study presents the computed Cronbach's alpha coefficients for each variable construct derived from the questionnaire. These coefficients were crucial indicators of the reliability of the measurement scales used in the study. Higher alpha values generally indicate

greater internal consistency among the items measuring each construct, suggesting that the items are measuring the same underlying concept effectively. Moreover, detailed outputs from the reliability analysis procedure conducted in SPSS are documented in Table 5 of the study. These outputs include comprehensive information such as item-level statistics, scale-level statistics, and reliability coefficients for each construct. This transparency and thoroughness in reporting the reliability analysis ensured that the study's findings were based on robust and dependable measurement instruments. Table 7 below provides an illustration of the reliability analysis utilizing Cronbach's alpha coefficient.

Table 7. Cronbach's Alpha for the two constructs.

Construct	Item	Cronbach's Alpha
Contract Management	Contract1	**0.946**
	Contract2	
	Contract3	
	Contract4	
	Contract5	
	Contract6	
	Contract7	
Inventory Management	Inventory1	**0.942**
	Inventory2	
	Inventory3	
	Inventory4	
Risk Management	Risk1	**0.833**
	Risk2	
	Risk3	
Project Performance	Project1	**0.843**
	Project2	

George and Mallery (2010) Offer a Guideline for interpreting Cronbach's Alpha. Cronbach's alpha is a measure of internal consistency reliability, used to assess how well a set of items in a questionnaire or scale measures a single construct. The coefficients can range from 0 to 1, where higher values indicate greater internal consistency among the items. Coefficients less than 0.5 are classified as "Unacceptable." This range suggests that the items in the questionnaire or scale are not measuring the construct reliably. Internal consistency is considered inadequate, indicating that the items may not be sufficiently related to each other to provide a consistent measurement. Coefficients greater than 0.5 but less than 0.7 are categorized as "Poor." While these coefficients indicate some degree of internal consistency, it is still considered less than desirable. The items may be measuring the construct, but with a moderate level of reliability. In this study, all the constructs demonstrated strong to excellent Cronbach's alpha values. That is: val-

ues less than 0.5 are categorized as "Unacceptable," indicating poor internal consistency reliability; values greater than 0.5 but less than or equal to 0.6 are classified as "Poor," suggesting weak internal consistency; values greater than 0.6 but less than or equal to 0.7 are labeled as "Questionable," indicating moderate internal consistency; values greater than 0.7 but less than or equal to 0.8 are considered "Acceptable," signifying reasonably good internal consistency; values greater than 0.8 but less than or equal to 0.9 are termed "Good," indicating strong internal consistency; values greater than 0.9 but not exceeding 0.95 fall into the category of "Excellent," suggesting very strong internal consistency. These classifications helped assess the reliability of scales or constructs measured by Cronbach's alpha, providing insights into the consistency of responses within a questionnaire or survey. See Table 8 below.

Table 8. Cronbach Alpha classifications.

Range of value	Status
Less than 0.5	Unacceptable
Greater than 0.5	Poor
Greater than 0.6	Questionable
Greater than 0.7	Acceptable
Greater than 0.8	Good
Greater than 0.9 but not greater than 0.95	Excellent

Component-Based Scores

A component-based score is a composite score that is simply an average of the scores on all the items that loaded strongly on a particular component. For example, Contract1, Contract2, Contract3, Contract4, Contract5, Contract6, Contract7 all loaded strongly on Component 1. Each score for each of these items was averaged to generate a component-based score for contract management. The component-based scores for the four components (which will now be known as variables) were used in the hierarchical multiple regression below. The means, standard deviations and correction coefficients for the three variables, the control variables and the dependent variable (enrollment) are shown in Table 9.

Table 9. Correlation matrix and descriptive statistics of study variables.

	MEAN	STD. D	CM	IM	RM	PP	QUAl	EX
Contract Management	32.576	1.303	1					
Inventory Management	18.903	1.175	−0.293	1				
Risk Management	14.634	0.595	0.302	−0.369	1			
Project Performance	9.653	0.519	−0.249	0.073	−0.227	1		
Qualifications	8.870	45.834	−0.047	0.135	0.087	0.094*	1	
Experience	2.270	0.448	−0.07	0.013	0.376*	0.071	−0.087	1

*Correlation is significant at the 0.05 level (2-tailed).

From Table 9, it was observed that none of the control variables (Education, Experience) was significantly related to the dependent variable, Project Performance, at the 0.05 level of significance. Specifically, Education (correlation = 0.094, $p > 0.05$) was not significantly related to Project Performance and Experience (correlation = 0.071, $p > 0.05$) was not significantly related to Project Performance. However, contract management was not significantly related to Project Performance (correlation = −0.249, $p > 0.05$). However, Risk Management was significantly related to Project Performance (correlation = −0.227, $p > 0.05$), and Inventory Management was insignificantly related to Project Performance (correlation = 0.073, $p > 0.05$). The correlation matrix in Table 9 helps us to determine if multicollinearity would be a problem if we conduct OLS multiple regression. All the correlations for the continuous independent variables are less than 0.7, hence multicollinearity is not an issue.

Hierarchical Multiple Regression Analysis

Hierarchical multiple regression analysis is a statistical technique used to explore the relationship between multiple predictor variables and a single outcome variable. It builds upon the basic principles of multiple regression by introducing a systematic approach to entering predictor variables into the regression equation (Tabachnick & Fidell, 2014). To begin hierarchical multiple regression analysis, there is need to evaluate several assumptions to ensure the validity and reliability of the findings. These assumptions typically include assessing the linearity of relationships between variables, verifying that residuals are normally distributed, confirming that there is no multicollinearity among predictor variables, and ensuring that residuals exhibit homoscedasticity (equal variance). Once these assumptions are met, the hierarchical multiple regression analysis proceeds. This method involves systematically entering predictor variables into the regression equation in stages or blocks. The order of entry is predetermined based on theoretical or practical considerations. Thus, in order to conduct a hierarchical multiple regression analysis, the following assumptions (eight key) were evaluated thereafter the procedure was run to obtain the results.

Assumption #1: You have one dependent variable that is measured at a continuous level (i.e., the interval or ratio level). In this study, the dependent variable, project performance, was considered a continuous variable after the component-based scores were computed.

Assumption #2: You have one or more independent variables that are measured on either a continuous or nominal scale. In this study, the following independent variables were continuous variables after the component-based scores were computed: contract management, inventory management, and risk management. The control variables used were Experience (ordinal), and Education (ordinal).

Assumption #3: There should be independence of errors (residuals). The Durbin-Watson was 1.518, which is between 1.5 and 2.5, and therefore, the data is not auto-correlated. There was the independence of residuals as assessed by a Durbin-

Watson statistic of 0.966.

Assumption#4: There should be a linear relationship between the predictor variables and the dependent variable. To establish if a linear relationship exists between the dependent and independent variables collectively, a scatter plot of the standardized residuals against the unstandardized predicted values was plotted using the chat builder in SPSS. The residuals form a horizontal band as shown in the scatter plot. Therefore, the relationship between the dependent variable and independent variables is linear. To establish if a linear relationship exists between the dependent variable and each of the independent partial regression plots from SPSS were used;

1) Contract Management: A partial regression plot shows a linear relationship between contract management and project performance.

2) Inventory Management: A partial regression plot shows a linear relationship between inventory management and project performance.

3) Risk Management: A partial regression plot shows a linear relationship between risk management and project performance.

Assumption #5: There should be homoscedasticity of residuals (equal error variances). The assumption of homoscedasticity was checked using the plot for standardized residuals against the unstandardized predicted values. The residuals appear randomly scattered. On this basis, it appears that the assumption of homoscedasticity has been made.

Assumption#6: There should be no multicollinearity. To check for multicollinearity, correlation coefficient and tolerance/VIF values were inspected. None of the independent variables had correlations greater than 4.7. In the coefficient output, none of the variance VIF is greater than 5, so multicollinearity should not be a problem with this data set.

Assumption#7: There should be no significant outliers, high-leverage points, or highly influential points. To check for outliers, standardized residuals, and standardized deleted residuals were inspected from the SPSS output residual statistics. Values greater than ±3 are an indication of the presence of an outlier. From the residual statistics table, none of the standardized residuals and standardized deleted residuals were outside the ±3 cutoff criteria for outliers therefore, there was no evidence of outliers in the data set. To check whether any cases exhibit high leverage, one general rule of thumb is to consider leverage values less than 0.2 as safe, 0.2 to less than 0.5 as risky, and values of 0.5 and above as dangerous (Huber, 1981). From the residual statistics table in the maximum leverage point is 0.27245 and the minimum leverage point is −1.80722. In this data, there are no leverage values above the safe value of 0.2. Therefore, there is no residual with a high leverage point. To check for influential points cook's Distance values for each case were inspected. As a rule of thumb, if there are Cook's Distance values above 1, they should be investigated. From the residual statistics, the maximum Cook's value is 0.784 and the minimum value is 0.000. There were no Cook's distance values above 1, therefore no evidence of an influential case (Cook and Weisberg,

1982).

Assumption #8: Errors (residuals) should be approximately normally distributed. Two methods were used to check for the assumptions of normality of the residuals: A histogram with a superimposed normal curve and a P-P Plot produced by SPSS. From the histogram, the standardized residuals appear to be approximately normally distributed. To confirm this finding, the P-P Plot was examined. From the P-P Plot, although the points are not aligned perfectly along the diagonal line, there are close enough to indicate that residuals are close enough to normal for the analysis to proceed.

There was linearity as assessed by partial regression plots and a plot of studentized residuals against the predicted values. There was the independence of residuals, as assessed by a Durbin-Watson statistic of 0.966. There was homoscedasticity, as assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values. There was no evidence of multicollinearity, as assessed by correlations and VIFs. There were no studentized deleted residuals greater than ±3 standard deviations, no leverage values greater than 0.2, and values for Cook's distance above 1. The assumption of normality was met, as assessed by the histogram of residuals and the P-P Plot.

Interpretation of the Findings

A hierarchical multiple regression was run to determine if contract management, inventory management and risk management affect project performance at Lusaka Water and Sanitation Company over and above the control variables of Experience and Education.

Table 10. Model summary[b].

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R.S. Change	F Change	df1	df2	F Change	D-W
1	0.412[a]	0.170	0.080	0.49851	0.170	1.882	5	46	0.116	0.966

[a]Predictors: (Constant), Experience, Inventory_Management, Education, Contract_Management, Risk_Management; [b]Dependent Variable: Project_Performance.

In Table 10, The full model summary table provides an overview of how well the independent variables (Experience, Inventory Management, Education, Contract Management, and Risk Management) collectively predict the dependent variable (Project Performance). In the table above, the R value of 0.412 indicates the strength and direction of the linear relationship between the predictors and Project Performance. This value suggests a moderate positive correlation, meaning that as the combined values of the independent variables increase, Project Performance also tends to increase, albeit moderately. R^2 (coefficient of determination) is 0.170, meaning that 17% of the variance in Project Performance can be explained by the predictors included in the model. While the model does explain some variance, the remaining 83% of the variability is due to factors not captured by this model. The Adjusted R^2 value of 0.080 provides a more accurate measure

of the model's explanatory power by adjusting for the number of predictors in the model. This lower value indicates that, when taking the complexity of the model into account, only 8% of the variance in Project Performance is meaningfully explained. The standard error of the estimate is 0.49851, which represents the average distance that the observed values fall from the regression line. In other words, this value quantifies the accuracy of the model's predictions. The standard error here is moderate. It reflects that while the model's predictions are not far off, they are not highly precise either. The F-statistic of 1.882 tests the overall significance of the regression model. However, the *p*-value (Sig. F Change) of 0.116 is greater than the common significance threshold of 0.05. This indicates that the predictors do not collectively explain a statistically significant proportion of variance in Project Performance.

Table 11. Coefficients.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	14.136	2.172		6.510	0.000		
	Contract_Management	0.084	0.058	−0.211	1.441	0.002	0.841	1.189
	Inventory_Management	0.106	0.066	0.239	1.603	0.014	0.810	1.234
	Risk_Management	−0.290	0.144	−0.332	−2.020	0.049	0.667	1.500
	Education	0.001	0.002	0.116	0.851	0.399	0.967	1.034
	Experience	0.219	0.174	0.189	1.257	0.215	0.800	1.249

In Table 11, the unstandardized coefficient for Contract Management is −0.084, indicating a negative relationship with project performance. The t-value is −1.441 with a *p*-value of 0.156. Since the *p*-value is greater than 0.05, Contract Management does not have a statistically significant effect on project performance. A study by Dai and Wells (2004) revealed a strong positive correlation between effective contract management and successful project delivery, suggesting that while a positive effect is expected, it was not significant in this sample.

The coefficient for Inventory Management is 0.106, indicating a positive relationship with project performance. The t-value is 1.603 with a *p*-value of 0.116. This effect is not statistically significant, meaning the observed positive relationship cannot be considered reliable at the 5% significance level. A study by Sama and Mdemu (2024) in the telecommunications industry in Malaysia found that strong inventory management practices contribute to improved service delivery and project success, which aligns directionally with the current results but was not confirmed statistically.

Furthermore, the coefficient for Risk Management is −0.290, indicating a negative relationship with project performance. The t-value is −2.020 with a *p*-value of 0.049, which is just below the 0.05 threshold. Even though respondents gave

very high ratings for risk management, suggesting that LWSC's practices are viewed positively, the regression results showed a significant negative effect on project performance. One possible reason is due to multicollinearity. Risk management may be closely related to other factors like contract and inventory management, which can distort the regression coefficients and produce unexpected results (Kutner et al., 2005). In addition, while employees perceived risk management efforts as strong, some strategies, such as overly cautious approaches, might slow down projects or make decision-making less flexible, which can negatively impact performance (Hillson, 2009). This shows that high perception scores don't always translate directly into better project outcomes.

Table 12. Hypothesis results.

Hypothesis	t value	*p* value	Comment
H_1: Contract management has a significant positive effect on the performance of projects implemented at the Lusaka Water and Sanitation Company.	1.441	0.156	**Not Supported**
H_2: Inventory management has a significant positive effect on project performance at Lusaka Water and Sewerage Company.	1.603	0.014	**Not Supported**
H_3: Risk mitigation has a significant positive effect the performance of projects implemented at Lusaka Water and Sanitation Company.	−2.020	0.0.049	**Supported**

Table 12 above reveals the following:

H1 is not supported because the negative t-value and $p = 0.156 > 0.05$.

H2 is not supported because $p = 0.116 > 0.05$, despite the positive coefficient.

H3 is supported because $t = -2.020$ and $p = 0.049 < 0.05$, indicating a statistically significant negative effect.

5. Discussion

5.1. Objective One: To Ascertain the Effect of Contract Management on the Project Performance at the Lusaka Water and Sanitation Company

The study indicated that the mean values for the contract management items/statements ranged from 4.52 to 4.81. This suggested that respondents generally agreed that LWSC conducts invitation to and evaluation of bids, awarding and implementation of contracts, measurement and payment calculation, monitoring contract implementation, integrates essential contract modifications, approves and administers contract variations and modifications, and cancels or terminates contracts, with most responses concentrated in the "Agree" to "Strongly Agree" categories. This meant that contract management was perceived positively by employees.

However, the study revealed that the hypothesis "contract management has a significant positive effect on the performance of projects implemented at the Lu-

saka Water and Sanitation Company" was not supported. This implies that while contract management is practiced and viewed positively at LWSC, it does not have a statistically significant impact on project performance in the current study.

These findings differ from some previous research in the field. For instance, Kafula et al. (2023) highlighted that strong contract administration can foster stakeholder satisfaction, potentially enhancing overall project performance. Ochara (2023) also emphasized that robust contract management practices are essential for improving operational performance in public entities.

Although LWSC demonstrates positive practices in contract management, the current results suggest that other factors may play a stronger role in determining project performance. This highlights the need for organizations to not only focus on contract administration but also integrate complementary practices such as risk management, inventory control, and team capability development to drive project outcomes.

5.2. Objective Two: To Determine the Effects of Inventory Management on Project Performance at Lusaka Water and Sanitation Company

The study showed that the Inventory mean values varied from 4.60 to 4.92. This demonstrated a strong positive agreement among respondents about inventory management practices. In addition, this indicated that the majority of respondents generally agreed that LWSC conducts vendor-managed inventory, material requirement planning, Just-in-Time practices, and storage and tracing.

However, the results revealed that the hypothesis "inventory management has a significant positive effect on project performance" was not supported. This suggests that, although inventory management practices at LWSC are viewed positively and implemented effectively, they do not have a statistically significant impact on project performance in the current study.

These findings partially contrast with prior research. For instance, Ochara (2023) emphasized that effective inventory management practices can enhance project performance. In addition, Kafula et al. (2023) highlighted that efficient inventory management systems improve operational efficiency and project outcomes. Furthermore, Nuhu (2025) in the food supply chain sector in Bangladesh stressed the importance of effective inventory control in reducing operational costs and enhancing customer satisfaction.

Although these studies support the potential benefits of inventory management, the current results suggest that inventory practices at LWSC, while positively perceived, may not directly translate into measurable improvements in project performance.

5.3. Objective Three: To Evaluate the Effect of Risk Mitigation on Project Performance at the Lusaka Water and Sanitation Company

The study found that the mean values ranged from 4.79 to 4.98. This indicated

that the majority of respondents generally agreed that LWSC conducts identification and assessment of risks, implements risk mitigation strategies, and monitors and evaluates risks. The high mean values suggested that respondents felt very positively about the organization's risk management efforts.

However, the regression results revealed that the hypothesis "risk mitigation has a significant effect on the performance of projects implemented at Lusaka Water and Sanitation Company" was supported, with a negative coefficient ($B = -0.290$, $\beta = -0.332$, $t = -2.020$, $p = 0.049$). This indicates that, despite the positive perceptions of risk management practices, higher levels of risk management were associated with slightly lower project performance in this study.

This finding contrasts with prior research. For example, Pinto and Prescott (1988) in the construction industry in the USA found that effective risk management practices positively influence project performance. Similarly, Hillson (2009) emphasized that comprehensive risk management frameworks generally lead to improved outcomes. The current study suggests that while LWSC implements risk management practices effectively, certain strategies may inadvertently slow project processes or create constraints that slightly reduce measurable performance outcomes.

Furthermore, Kutsch and Hall (2010) highlighted that inadequate risk identification and management could lead to project failures. The negative relationship observed in the current study shows the complexity of risk management.

6. Conclusion

Procurement management is an essential component of project performance, particularly in large-scale organizations such as Lusaka Water and Sanitation Company. The effective management of procurement processes spanning from contract management to inventory management and risk mitigation directly influences the success of projects. Despite a growing body of research globally, limited attention has been given to the specific effects of procurement management on project performance in Zambia's water and sanitation sector. This study sought to fill that gap by assessing the effects of procurement management on project performance at Lusaka Water and Sanitation Company. The main objective of the study was to establish the effects of procurement management on project performance at Lusaka Water and Sanitation Company. Three hypotheses were formulated based on the specific objectives of the study.

The first hypothesis (H_1) proposed that contract management has a significant positive effect on project performance at Lusaka Water and Sanitation Company. The results supported this hypothesis ($B = 0.084$, $\beta = -0.211$, $t = -1.441$, $p = 0.156$), indicating that effective contract management practices positively influence project outcomes, including cost control and timely project completion. This confirms that proper management of contracts is critical to achieving project objectives.

The second hypothesis (H_2) proposed that inventory management positively

affects project performance at Lusaka Water and Sanitation Company. This hypothesis was not supported (B = 0.106, β = 0.239, t = 1.603, p = 0.116), suggesting that, although respondents perceived inventory management practices positively, their direct impact on project performance in this study was not statistically significant.

The third hypothesis (H_3) suggested that risk management has a significant positive effect on project performance at Lusaka Water and Sanitation Company. This hypothesis was rejected because the results revealed a significant negative effect of risk management on project performance (B = −0.290, β = −0.332, t = −2.020, p = 0.049). This indicates that, while risk management practices were viewed positively, they were associated with slightly lower project performance in this study.

Conflicts of Interest

The authors declare no conflict of interest.

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