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THE EFFECT OF PROCUREMENT CONTRACT MANAGEMENT ON WATER PROJECT LEAD TIME MANAGEMENT AT RUWASA-DODOMA REGION TANZANIA

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Abstract:
The problem addressed in this study is the persistent delays in managing project timelines for water projects at RUWASA. Have resulted in extended lead times, negatively impacting project outcomes and service delivery. Water projects face challenges in managing project timelines, resulting in extended lead times and negative effects on project outcomes. Therefore, the study aimed to investigate the effect of procurement contract management, on water project lead time management at RUWASA-Dodoma region. The research applied the principal-agent theory to understand the dynamics between stakeholders in procurement and used a cross-sectional research design targeting a population of 150 individuals, with 109 respondents selected through simple random. Data collection included questionnaires and the analysis employed descriptive statistics and multiple regression analysis to provide comprehensive insights. The findings revealed significant relationships between procurement efficiency and project lead time management. Descriptive statistics highlighted trends such as delays in contract execution while regression analysis demonstrated that effective procurement strategies positively impacted project timelines. The study concluded that procurement contract management has a significant effect on water project lead time management at RUWASA-Dodoma Region, Tanzania. The study recommended that RUWASA should improve contract management by focusing on clearer and more specific terms in procurement contracts, as this would help address the challenges and inefficiencies hindering project timelines.

Keywords:
Procurement, Procurement Contract, Procurement Contract Management, Lead Time And Lead Time Management

1. Introduction
Public projects are initiatives managed by the government or state aimed at addressing community needs Globally, effective procurement contract management is crucial for ensuring the timely and successful implementation of water projects. It involves a series of processes, including drafting, negotiation, execution, and monitoring of contracts to achieve project objectives within the set timeframes and budgets (Anderson, & White, 2023). According to Ankrah (2020), poor contract management is one of the primary reasons for delays in infrastructure projects, including those in the water sector, leading to cost overruns and compromised quality. In developed countries like the United States and Germany, advanced contract management systems, supported by robust legal frameworks and digital tools, have significantly reduced project delays and enhanced efficiency (Aputo, 2023). Conversely, in developing countries, challenges such as inadequate contract documentation, lack of enforcement mechanisms, and limited expertise often hinder effective contract management, resulting in prolonged project lead times.
In Africa, water projects are critical for addressing the continent's water scarcity challenges and improving access to clean water. Effective procurement contract management in this sector is pivotal to overcoming obstacles such as funding limitations, inadequate infrastructure, and administrative inefficiencies. A study by Julius and Gershon (2019) highlighted that 65% of water projects in sub-Saharan Africa experienced delays primarily due to poor contract management practices, including unclear contract terms, inadequate risk allocation, and weak monitoring mechanisms. Countries like South Africa and Kenya have made strides in improving procurement contract

management by adopting comprehensive legal frameworks and capacity-building initiatives. However, many other countries continue to struggle with challenges related to corruption, inadequate contractor performance, and lack of transparency, which significantly affect project timelines and outcomes cite.

Focusing on East Africa, countries such as Kenya, Uganda, and Tanzania have undertaken numerous water projects to improve water accessibility and sanitation including The Western Kenya project in Kenya, WATSAN water project in Uganda and Water projects in Tanzania in Bahi town, Kondoa town, Chamwino town and Dodoma city (Mwega, 2023). Despite these efforts, contract management remains a significant bottleneck in achieving project completion within the planned timelines. Studies by Aputo (2023) show that delayed water projects in East Africa are often linked to issues such as contract disputes, poor contractor performance, and delays in payments. Additionally, the lack of standardized contract management practices and inadequate oversight further exacerbate these issues, leading to increased project lead times and cost escalations (Kijaji & Rwekaza, 2023). This calls for the adoption of more robust procurement contract management systems, including improved contractor evaluation processes, clearer contractual obligations, and enhanced capacity for contract monitoring and enforcement.

In Tanzania, the management of procurement contracts in water projects has been a topic of growing concern due to its impact on the timely delivery of these essential services (Msanga, 2020). The Rural Water Supply and Sanitation Agency (RUWASA) is at the forefront of implementing water projects aimed at improving rural water supply. However, despite efforts to streamline procurement processes, contract management issues have led to significant project delays (Kijaji & Rwekaza, 2023). A study by the Public Procurement Regulatory Authority (PPRA) revealed that 40% of water projects under RUWASA faced delays due to contract management inefficiencies, highlighting the need for improved contract administration, risk management, and performance evaluation mechanisms (PPRA, 2023).

Several factors contribute to the challenges faced in procurement contract management for water projects in Tanzania. Key among these are the lack of skilled personnel, inadequate use of contract management tools, and the absence of a robust legal framework to enforce compliance (Mgawe & Masanja, 2023). Mwega (2023) noted that while Tanzania has made progress in strengthening its procurement processes through reforms and capacity-building programs, the translation of these efforts into improved contract management practices remains limited. Therefore, this study intends to investigate the effect of procurement contract management, on water project lead time management at RUWASA-Dodoma region.

2. Literature Review

2.1 Theoretical Literature

2.1.1 The Principal-Agent Theory

The foundational concepts of Principal-Agent Theory can be traced back to earlier thinkers like Adam Smith and John Stuart Mill, and explored relationships of power and control between parties. However, the modern formulation of Principal-Agent Theory, which focuses on the dynamics between principals and agents, gained prominence in the 1970s and 1980s with key contributions from Jensen and Meckling (Belay, 2023). This theory is fundamental to economics and organizational behavior, as it addresses the conflicts of interest that may arise between a principal (such as an employer or investor) and an agent (such as a manager or contractor) due to differences in information, risk preferences, and incentives. It explores the risks of moral hazard and adverse selection and offers mechanisms to mitigate these issues through contracts, monitoring, and performance-based incentives (Nguyen, 2023).

One of the major strengths of Principal-Agent Theory is its versatility across a wide range of disciplines. The theory has been applied to corporate governance, policymaking, international relations, and even interpersonal dynamics (Kim & Lee, 2023). It offers critical insights into the design of incentive systems, helping to align the interests of principals and agents to improve organizational efficiency and reduce conflicts. Specifically, the theory allows for the structuring of contracts and monitoring frameworks that promote accountability and performance across different settings, from business to government operations.

However, Principal-Agent Theory has faced criticism, particularly concerning its assumptions and the challenges of applying it to complex human behavior. The theory assumes rationality in agents and principals, which may not fully capture real-world social dynamics, trust, or cultural nuances that influence relationships between parties (Riley & Zhang, 2023). Additionally, scholars such as Williamson (2023) have noted that the theory's focus on formal

mechanisms, such as contracts and incentives, often overlooks informal factors like interpersonal trust, power asymmetry, and relational governance that shape principal-agent interactions. The theory also struggles with empirical validation in some contexts due to its abstract nature, which can make testing certain assumptions difficult.
Principal-Agent Theory (PAT) is highly relevant to this study, offering a theoretical framework to explore the relationship between RUWASA, as the principal, and contractors, as agents in water infrastructure projects. Efficient procurement and lead time management hinge on the alignment of interests between these parties. The theory highlights the importance of clearly defined contracts, effective monitoring mechanisms, and appropriate incentives to foster cooperation and minimize delays (John & Ochieng, 2023). Other studies, such as those by Msanga (2021) on road projects in Tanzania and Kagiri (2023) on government infrastructure in Kenya, have used Principal-Agent Theory to analyze procurement and project management, emphasizing how aligning agent behaviors with principal goals improves performance.

2.2 Empirical Literature

Recent studies have explored the relationship between procurement practices and project performance across various sectors, with findings highlighting key areas of improvement. For instance, Aputo (2023) re-examined the effects of procurement functions on project outcomes in NGOs in Nairobi County. Using an updated descriptive research design and a larger sample size, the study reinforced previous findings that need assessment, supplier sourcing, contract management, and inventory management remain critical to project success. Aputo emphasized that the consistent application of these functions significantly improves project performance in NGO operations. Similarly, Fore (2023) assessed the procurement processes in a project management company in Cape Town, South Africa, and found that corruption, favoritism, fraud, and supplier delays continued to be key contributors to procurement inefficiencies. However, the study introduced new insights, emphasizing the need for advanced digital systems and better training for procurement officers. Fore's findings align with recent literature stressing the importance of technology adoption, ethical practices, and policy compliance in procurement processes to ensure successful project execution.
Karimi (2023) revisited the issue of lead time in procurement management within Uganda's motor industry, finding that while fixed lead times had minimal impact, the management of pre-processing, processing, and post-processing lead times remained crucial for effective procurement outcomes. The study advocated for greater attention to dynamic lead time management to enhance procurement efficiency in the motor industry. Mgawe and Masanja (2023) conducted an updated assessment of procurement practices in Tanzania, focusing on the National Housing Corporation (NHC). The study found that effective contract monitoring and control significantly enhanced project performance. The authors recommended the integration of real-time monitoring systems to ensure timely procurement execution, a development from previous studies that mainly focused on manual methods.
On the other hand, Msanga (2023) expanded on earlier research by examining procurement procedures in road construction projects within the Temeke Municipality, Dar es Salaam. The study confirmed that procurement procedures, particularly bid evaluation and supplier selection, had a significant effect on the cost, quality, and time performance of public infrastructure projects. This study underscores the ongoing need for transparent and streamlined procurement processes to optimize public sector project outcomes. Kotu (2023) provided a comprehensive analysis of procurement management practices in Ethiopia, focusing on public health institute projects. The study reiterated that procurement practices such as contract management, supplier sourcing, and need assessment play a direct role in enhancing project performance. However, Kotu introduced new recommendations, advocating for policy reforms to improve procurement transparency and capacity building for procurement staff in the Ethiopian public sector.

2.3 Conceptual Framework

This study was guided by independent variable and dependent variable whereas water project lead time management is influenced by procurement contract management focused on clarity, specificity as well as contract performance. In that case, there is the relationship between procurement contract management and water project lead time management.

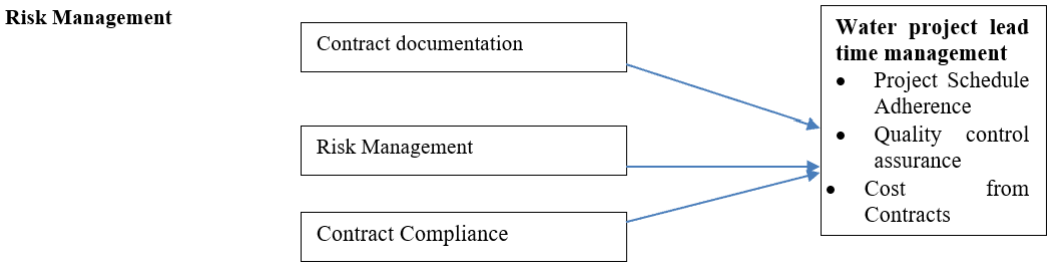

Figure 1.1 Conceptual Framework, 2024
Source: Field Data, 2024

Operationalization of the Variables

Contract Documentation

In the context of water projects, contract documentation plays a crucial role in defining the lead time necessary for project execution. Lead time refers to the period required to complete all preparatory activities before actual construction begins. This includes planning, permitting, procurement, and mobilization phases (Ankrah, 2020).

Risk Management

Risk management in projects is a critical process that involves identifying, assessing, and prioritizing risks associated with the planning, execution, and completion of infrastructure projects. The lead time for these projects can be significantly affected by various risk factors, which can delay timelines and increase costs (Aputo, 2023).

Contract Compliance

In the context of projects, which often involve significant infrastructure development and long lead times, ensuring compliance is critical for successful project execution. The complexities associated with projects can include regulatory requirements, environmental considerations, and financial obligations, all of which necessitate a robust compliance framework (Belay, 2023).

3. Methodology

3.1 Research Design

A cross-sectional design was adopted, capturing and analyzing data at a single point in time to identify patterns and relationships between various factors affecting project timelines.

3.2 Research Approach

The study used quantitative approach. Quantitative research allowed for the collection of numerical data that can be statistically analyzed (Bryman & Bell, 2015). A quantitative approach lends itself to objectivity, minimizing biases that might arise from subjective interpretations. This is crucial when assessing the effectiveness of procurement processes and their impact on project timelines. Quantitative methods enable the use of statistical tests to determine the significance of the relationships between procurement contract management practices and lead time management, offering strong conclusions.

3.3 Study Area

The study was conducted at RUWASA-Dodoma Region. This is due to the fact that there have been the delays of water projects in rural areas particularly in Dodoma rural areas. For example, 53 out 58 water projects (equivalent to 91%) were not completed on time, and the average delayed time for completion of implemented water projects in rural areas was 480 days (HR, 2023).

3.4 Study Population
The research population included 150 RUWASA staff members, comprising both senior and operational staff involved in the procurement process.

3.5 Sample Size
The sample size of the study was justified using Yamane formula (1967), divided into 11 senior staff members (10.1%) and 98 operational staff members (89.9%).

$$n = \frac{N}{1 + Ne^2}$$

Where;
n= is number of sample (required)
N = Total population (150) and
e = Error tolerance (level) or margin of error (0.05)
150/ (1+150(0.05)2) = 150/1.375= 109

3.6 Data Collection Instruments
Data collection was conducted through structured questionnaires Operational staff received questionnaires designed to gather quantitative data on procurement practices, distributed both electronically and in physical form to maximize participation. The collected data was analyzed using descriptive analysis and multiple linear regression .

3.7 Sampling Techniques
The study used two different sampling strategies to select its participants: and then proportionate stratified sampling to group staff into strata, simple random sampling selecting individuals from each stratum Simple random sampling is a probability-based method where each member of the population has an equal chance of being selected (Bryman, & Bell, 2015) In the context of this study, operational staff refers to employees who perform day-to-day tasks and duties within an organization. The use of simple random sampling ensures that all operational staff members have an equal opportunity to be selected for the study, regardless of their position, tenure, or any other factors.

3.8 Validity and Reliability of the Data
3.8.1 Validity of Data
This is referred to a degree to which the outcomes of a measurement truly reflect the targeted variable, as outlined by Cohen et al. (2014). To evaluate the reliability of the research instruments, the study sought guidance from a field expert, particularly the supervisor. This approach facilitated the modification and adjustment of the study tools as necessary, thereby enhancing the validity of the research.

3.8.2 Reliability of Data
The ability of a tool to consistently and accurately measure the intended phenomenon is referred to as reliability (Alvi, 2016). To evaluate the scale's reliability for each variable, the study analyzed the internal consistency of the variables (items) through Cronbach's Alpha. Cronbach's Alpha reliability measure operates under the assumption that all items and questions are equally reliable. A minimum acceptable value of 0.7 or above is set for each indicator. The assessment criteria were based on the smallest acceptable value of the alpha coefficient, which is established at 0.7.

Table 1 Reliability Statistics

Variables	**Cronbach's Alpha**
Contract documentation	0.781
Risk management	0.827
Contract compliance	0.821
Water project lead time management	0.920

Source: Field Data, 2024

The table presents reliability statistics for various variables associated with project management in the context of water projects, measured using Cronbach's Alpha. This statistical measure assesses the internal consistency of a set of items, indicating how closely related they are as a group. A higher alpha value suggests a higher level of reliability.
Starting with contract documentation which has a Cronbach's Alpha of 0.781, this indicates a good level of reliability. This suggests that the items measuring contract documentation are consistently portraying a coherent concept, which is crucial for ensuring that all contractual obligations are clear and well understood among stakeholders. Risk management follows with an alpha of 0.827, demonstrating even stronger reliability. This high score implies that the measures related to identifying, assessing, and mitigating risks in water projects are well-aligned and can be trusted to provide valuable insights. Effective risk management is vital in project execution, as it helps to anticipate and address potential issues before they impact project outcomes.
For contract compliance, the Cronbach's Alpha is 0.821, also indicating good reliability. This suggests that the metrics used to evaluate adherence to contractual terms are consistent. High contract compliance is essential for maintaining project integrity and ensuring that all parties fulfill their obligations, thus minimizing disputes and enhancing project success. The variable with the highest reliability is water project lead time management, which boasts a Cronbach's Alpha of 0.920. This exceptional score indicates a very high level of internal consistency among the items measuring lead time management. Efficient management of project timelines is critical, particularly in water projects where delays can have significant implications for resource availability and community impact. In summary, the implications of these reliability statistics suggest that the measured variables are reliable indicators of their respective constructs within the context of water project management. The high levels of internal consistency, particularly in lead time management, highlight the importance of these factors in ensuring successful project execution. Stakeholders can trust that the data derived from these measures will provide a solid foundation for decision-making and strategic planning in future water projects.

3.9 Data Analysis

The study used descriptive analysis and multiple linear regression analysis to analyze data. The reason behind to use multiple linear regression analysis was to establish relationship between independent variables and dependent variable. The regression model is as follows

$$Y = \beta o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + e$$

Where by
Y= Water project lead time management
βo = Constant factor
X_1 = Contract documentation
X_2= Risk management
X_3= Contract compliance
e = Error term

4. Results

4.1 Descriptive Analysis

Descriptive statistics in this objective was to assess the effect of procurement contract management on water project lead time management at RUWASA-Dodoma Region, Tanzania.

The objective of this analysis was to assess the effect of procurement contract management on the lead time management of water projects at RUWASA in Dodoma Region, Tanzania. Descriptive statistics were used to analyze responses from 101 individuals regarding various aspects of procurement contract management and its impact on project lead times.

The clarity of procurement contracts was assessed with a mean score of 4.18 and a standard deviation of 1.053. This high mean score indicates that respondents generally agreed that clear procurement contracts significantly enhance the efficiency of water project lead time management. The statement "The procurement contracts for water projects are clear and easily understandable" received a mean score of 4.09 with a standard deviation of 1.123. This result suggests that respondents generally found the contracts to be understandable, which is essential for ensuring that all stakeholders can effectively interpret and execute the contract terms. Respondents rated the clarity of project deliverables and milestones in procurement contracts with a mean score of 3.34 and a standard deviation of 1.478. This lower mean indicates some variability in perceptions, suggesting that while some contracts clearly define deliverables and milestones, others may not.

The inclusion of specific requirements in procurement contracts had a mean score of 3.52 and a standard deviation of 1.270. This score reflects a moderate agreement that specific requirements in contracts contribute to better lead time management. The adherence of project stakeholders to the terms and conditions outlined in procurement contracts was rated with a mean score of 4.09 and a standard deviation of 1.141. High adherence to contract terms is crucial for maintaining project timelines, as deviations can lead to delays and increased costs.

The enforcement of contract compliance measures received the highest mean score of 4.35 with a standard deviation of 0.910. This indicates a strong agreement that effective enforcement of compliance measures is critical for managing project lead times.

Table 2 Procurement contract management

	N	Minimum	Maximum	Mean	Std. Deviation
Clarity of procurement contracts impact the efficiency of water project lead time management at RUWASA-Dodoma Region	101	1	5	4.18	1.053
The procurement contracts for water projects are clear and easily understandable	101	1	5	4.09	1.123
Procurement contracts for water projects clearly define project deliverables and milestones.	101	1	5	3.34	1.478

The inclusion of specific requirements in procurement contracts contributes to better lead time management.	101	1	5	3.52	1.270
Project stakeholders adhere to the terms and conditions outlined in procurement contracts.	101	1	5	4.09	1.141
The enforcement of contract compliance measures is effective in managing project lead time.	101	1	5	4.35	.910

Source: Field Data, 2024

4.2 Regression Analysis

4.2.1 Model Summary

Table 3 presents a summary of a statistical model, providing essential metrics that help evaluate its performance. The first column lists the model number, which in this case is labeled as "Model 1." The subsequent columns include various statistical values that assess the model's fit and predictive capability.

Table 3 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.900[a]	.810	.804	.303

a. Predictors: (Constant), Contract documentation, risk management, contract compliance

Source: Field Data, 2024

Table 3 presents a summary of a regression model that evaluates the relationships between several predictor variables and an outcome of interest. The model includes three predictors: contract documentation, risk management, and contract compliance. The statistics provided indicate the effectiveness of these predictors in explaining the variance in the dependent variable. The R value of 0.900 signifies a strong positive correlation between the predictors and the dependent variable, suggesting that as the predictor variables increase, the dependent outcome also tends to increase. This strong correlation is further supported by the R Square value of 0.810, which indicates that approximately 81% of the variance in the dependent variable can be explained by the model. This high percentage suggests that the model is quite effective in capturing the relationships within the data.

The Adjusted R Square value of 0.804 takes into account the number of predictors in the model, providing a more accurate assessment of the goodness-of-fit when multiple predictors are involved. The slight decrease from the R Square value indicates that the model remains robust even after adjusting for the number of predictors. Finally, the Standard Error of the Estimate is 0.303, which gives an indication of the average distance that the observed values

fall from the regression line. A lower standard error suggests that the predictions made by the model are relatively close to the actual data points. The implications of this model summary are significant for stakeholders involved in contract management and compliance. The strong predictive capability of the model underscores the importance of effective contract documentation, robust risk management practices, and adherence to contract compliance. Organizations may use these insights to prioritize improvements in these areas, potentially leading to better project outcomes and minimized risks. Additionally, the data suggests that further exploration into these variables could yield even more refined strategies for enhancing contract performance and overall organizational efficiency.

4.2.2 Analysis for Variance (ANOVA)

The ANOVA table presented summarizes the results of a statistical analysis assessing the relationship between various predictors and the dependent variable, which in this case is "Water project lead time management." The table is structured to display key metrics that help evaluate the overall significance of the regression model.

Table 4 ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	37.809	3	12.603	137.602	.000[b]
	Residual	8.884	97	.092		
	Total	46.693	100			

a. Dependent Variable: Water project lead time management

b. Predictors: (Constant), Contract Documentation, Risk Management, Contract Compliance

Source: Field Data, 2024

Table 4 presents the results of an Analysis of Variance (ANOVA) conducted to evaluate the effectiveness of several predictors on the dependent variable, which is the management of water project lead times. The table provides key statistical metrics that help in understanding the relationships between the variables involved. The Sum of Squares for the regression model is 37.809, indicating the variation explained by the predictors (Contract Documentation, Risk Management, and Contract Compliance). With three degrees of freedom (df), the Mean Square for regression is calculated as 12.603. This value reflects the average variation explained by each predictor in the model. The F-statistic of 137.602 is significantly high, suggesting that the model is a good fit for the data. The associated p-value (Sig.) of .000 indicates that the relationship between the predictors and the dependent variable is statistically significant, meaning there is a very low probability that the observed results occurred by chance.

On the other hand, the Residual Sum of Squares is 8.884, with 97 degrees of freedom, resulting in a Mean Square of .092. This part of the table represents the variation in lead time management that is not explained by the predictors. The relatively low residual sum suggests that the model accounts for a substantial amount of the variability in the data. The total sum of squares for the model is 46.693, which combines both the explained and unexplained variation. The strong performance of the regression model, as indicated by the F-statistic and the p-value, implies that the selected predictors are influential in managing lead times for water projects. This has practical implications for project management, highlighting the importance of effective contract documentation, risk management, and compliance in improving project outcomes.

4.2.3 Coefficient

In the analysis presented in Table 5, several coefficients are reported for a model evaluating water project lead time management.

Table 5 Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.081	.218		.370	.712
	Contract documentation	.309	.144	.296	2.145	.034
	Risk management	.314	.148	.287	2.127	.036
	Contract compliance	.352	.144	.338	2.439	.017

a. Dependent Variable: Water project lead time management

Source: Field Data, 2024

Table 5 presents the coefficients from a regression analysis aimed at understanding factors that influence water project lead time management. The table includes both unstandardized and standardized coefficients, along with their respective standard errors, t-values, and significance levels. The unstandardized coefficients indicate the amount of change in the dependent variable—water project lead time management—resulting from a one-unit change in the independent variables, while the standardized coefficients (Beta) allow for comparison across different predictors. The constant term is 0.081, with a standard error of 0.218, yielding a t-value of 0.370 and a significance level of 0.712. This suggests that the constant is not statistically significant in predicting lead time management, indicating that other factors should be considered. Among the independent variables, contract documentation shows an unstandardized coefficient of 0.309 and a standardized coefficient of 0.296. The t-value of 2.145 and significance level of 0.034 imply that this variable has a statistically significant impact on lead time management at the 0.05 significance level. Risk management also has a notable effect, with an unstandardized coefficient of 0.314 and a standardized coefficient of 0.287. The t-value of 2.127 and significance level of 0.036 further confirm its significance, suggesting that effective risk management practices are essential for improving project timelines. Lastly, contract compliance yields the highest unstandardized coefficient at 0.352 and a standardized coefficient of 0.338. With a t-value of 2.439 and a significance level of 0.017, contract compliance emerges as a critical factor influencing lead time management, indicating that adherence to contractual terms may play a pivotal role in project efficiency.

The findings from this analysis have several implications for project management in the water sector. First, the significant roles of contract documentation, risk management, and contract compliance highlight the necessity for robust project planning and execution strategies. Stakeholders should prioritize enhancing these areas to mitigate delays and improve overall project performance. Moreover, the statistical significance of these factors suggests that investments in training and systems that bolster documentation, risk assessment, and compliance monitoring could lead to tangible improvements in project timelines. This could be especially relevant for policymakers and project managers seeking to optimize resource allocation and enhance the effectiveness of water projects.

Then from this formula

$$Y = \beta o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + e$$

Where by

$\boldsymbol{Y}$= Water project lead time management

$\boldsymbol{\beta o}$ = Constant factor

$\boldsymbol{X_1}$ = Contract documentation

$\boldsymbol{X_2}$= Risk management

$\boldsymbol{X_3}$= Contract compliance

$\boldsymbol{e}$ = Error term

Regression equation was
Water project lead time management = 0.309 Contract documentation + 0.314 Risk management + 0.352 Contract compliance – 0.081

5. Discussion

The clarity of procurement contracts was assessed with a mean score of 4.18 and a standard deviation of 1.053. This high mean score indicates that respondents generally agreed that clear procurement contracts significantly enhance the efficiency of water project lead time management. Clarity in contracts at RUWASA Dodoma region ensures that all parties have a mutual understanding of the requirements and expectations, reducing ambiguities that can lead to delays. Contracts that clearly outline roles, responsibilities, and timelines enable smoother project execution and reduce the likelihood of disputes. The importance of clear contracts in project management has been widely recognized in academic literature, which emphasizes that detailed and precise contract terms are critical for effective project management. Moreover, clear contracts help in setting realistic expectations and provide a framework for accountability, thereby enhancing overall project efficiency.

The study findings are supported by Msanga (2020) that procurement contracts that lack clarity can lead to ambiguity regarding the scope of work. This ambiguity can result in misunderstandings between the parties involved, leading to delays in project execution. A clear and detailed scope of work outlined in the contract ensures that all parties have a common understanding of what needs to be done, reducing the likelihood of disputes and streamlining project management processes. Clarity in procurement contracts is essential for effective risk management. Unclear contracts may leave room for interpretation, increasing the risk of disputes, claims, and potential legal issues. Through clearly defining roles, responsibilities, deliverables, timelines, and performance metrics in the contract, risks associated with the project can be identified and mitigated early on. This proactive approach to risk management helps in maintaining project timelines and ensuring efficient delivery of water projects.

The statement "The procurement contracts for water projects are clear and easily understandable" received a mean score of 4.09 with a standard deviation of 1.123. This result suggests that respondents generally found the contracts to be understandable, which is essential for ensuring that all stakeholders can effectively interpret and execute the contract terms. Contracts that are easy to understand help prevent misunderstandings and misinterpretations that can cause project delays. Simple and straightforward language in contracts facilitates better communication among all parties involved, including contractors, suppliers, and project managers. Effective communication is crucial for the successful implementation of projects, as it ensures that everyone is on the same page and reduces the potential for errors and delays. This finding aligns with previous studies that highlight the importance of clear and comprehensible contracts in preventing project delays and improving overall project outcomes.

The study findings are supported by Aputo (2023), who emphasizes that clear contracts are crucial for ensuring transparency in procurement processes. By explicitly outlining all terms, conditions, and requirements, clear contracts minimize the risk of misunderstandings and misinterpretations, thereby promoting fairness and reducing opportunities for corruption, favoritism, or unethical practices. This is particularly important in water projects, which often have intricate technical specifications, deadlines, payment terms, and legal obligations. A well-defined contract ensures that all parties involved are aware of their rights and responsibilities. Conversely, ambiguous contracts can lead to disputes, project delays, and costly legal conflicts, which undermine the efficiency and success of procurement activities. Respondents rated the clarity of project deliverables and milestones in procurement contracts with a mean score of 3.34 and a standard deviation of 1.478. This lower mean indicates some variability in perceptions, suggesting that while some contracts clearly define deliverables and milestones, others may not.

Clearly defined deliverables and milestones are crucial for tracking progress and ensuring timely completion of project phases. When project deliverables and milestones are explicitly stated, it allows for better monitoring and evaluation of the project's progress, making it easier to identify any deviations from the plan and take corrective actions promptly. The variability highlighted by this score points to the need for more consistent detailing in contracts to improve lead time management. Inconsistent definitions can lead to confusion and misalignment among project stakeholders, which can result in delays and increased project costs.

The study findings are linked to the study by Mgawe and Masanja (2018) that through clearly outlining project deliverables and milestones, procurement contracts help in managing risks associated with the project. When all parties involved understand what is expected at each stage of the project, it becomes easier to identify potential risks early on and take necessary actions to mitigate them. Defining clear project deliverables and milestones provides a basis for measuring the performance of the project. It allows for tracking progress, evaluating whether the project is on schedule, and assessing if the quality of deliverables meets the agreed-upon standards. This measurement is essential for ensuring accountability and successful project completion.

The inclusion of specific requirements in procurement contracts had a mean score of 3.52 and a standard deviation of 1.270. This score reflects a moderate agreement that specific requirements in contracts contribute to better lead time management. Specific requirements help ensure that all necessary elements are accounted for, reducing the risk of oversights that can delay projects. Through specifying detailed requirements, contracts can provide clear guidelines on the expected quality, scope, and timeline of the project, which helps in aligning the efforts of all stakeholders towards achieving the project goals. However, the moderate mean suggests room for improvement in detailing these requirements. The inclusion of specific, measurable, achievable, relevant, and time-bound (SMART) requirements can enhance the effectiveness of procurement contracts and contribute to more efficient project management.

The study findings are linked to the study by Karimi (2018) that when specific requirements are clearly outlined in procurement contracts, it helps in enhancing clarity and communication between the buyer and the supplier. Through specifying details such as quality standards, delivery schedules, quantities, and any other relevant terms, both parties have a clear understanding of what is expected. This clarity reduces ambiguity and minimizes the chances of misunderstandings or disputes that could potentially lead to delays in the procurement process. Having specific requirements in procurement contracts also aids in streamlining processes throughout the supply chain.

The adherence of project stakeholders to the terms and conditions outlined in procurement contracts was rated with a mean score of 4.09 and a standard deviation of 1.141. High adherence to contract terms is crucial for maintaining project timelines, as deviations can lead to delays and increased costs. When stakeholders strictly adhere to the agreed terms and conditions, it ensures that the project progresses as planned and reduces the likelihood of disputes and renegotiations. This high mean score indicates that respondents generally perceive strong adherence to contract terms, which positively impacts lead time management. The contracts often include provisions that outline how risks will be allocated between the parties involved. Through following these terms, stakeholders can reduce uncertainties and ensure that potential risks are appropriately managed throughout the project lifecycle. Procurement contracts typically involve multiple parties, such as buyers, suppliers, contractors, and subcontractors. Adhering to the agreed-upon terms fosters trust and collaboration among these stakeholders.

The enforcement of contract compliance measures received the highest mean score of 4.35 with a standard deviation of 0.910. This indicates a strong agreement that effective enforcement of compliance measures is critical for managing project lead times. Effective enforcement ensures that all parties meet their obligations, thus preventing delays and ensuring smooth project progression. Enforcement mechanisms such as regular audits, progress reports, and penalty clauses for non-compliance play a vital role in ensuring that project activities are carried out as per the contract terms. This finding supports the view that robust contract management practices are essential for successful project delivery. Through implementing stringent compliance measures, project managers can mitigate risks and ensure that projects are completed within the stipulated timelines and budget.

The analysis of procurement contract management at RUWASA in Dodoma Region reveals that clear, understandable contracts and effective enforcement of compliance measures are critical for managing lead times in water projects. While the clarity and specificity of project deliverables and milestones show some variability, overall, the findings suggest that strong contract management practices contribute significantly to efficient project timelines. These insights can guide improvements in procurement practices to further enhance the effectiveness of water project management. Through addressing the identified gaps and strengthening contract management processes, RUWASA can improve project outcomes and ensure the timely delivery of water projects, ultimately benefiting the communities they serve.

6. Conclusion and Recommendations

The study has highlighted the significant impact of procurement practices on the lead time management of water projects at RUWASA-Dodoma Region. Delays in water project completion are prevalent, with the majority of projects failing to meet deadlines. The research findings indicate that efficient procurement contract management, prompt order confirmation, and effective supplier communication are crucial for timely project delivery. Addressing these factors can reduce delays, thereby improving the overall efficiency of water project implementation in rural areas.

RUWASA should enhance procurement contract management by implementing rigorous monitoring and evaluation of supplier performance, streamline order confirmation processes by adopting digital tools to reduce bureaucratic delays, and improve supplier communication through clear and consistent channels. Additionally, continuous training and capacity building for staff in procurement and project management, along with the adoption of technology solutions for better tracking and transparency, are essential for reducing delays and improving project lead times.

7. Areas for Further Studies

Although this study provides valuable insights into the effect of procurement practices on lead time management for water projects, further research is recommended to explore the role of digital technologies in enhancing procurement efficiency. Specifically, future studies could investigate how the adoption of e-procurement systems, artificial intelligence, and blockchain technology might mitigate procurement-related delays and improve transparency. Additionally, examining procurement practices in other sectors, such as health or education, could offer a broader understanding of procurement challenges and solutions across different industries.

8. Limitation

The study was limited by the scope of its focus on the Dodoma Region, which may not reflect the procurement practices and challenges faced by other regions or sectors in Tanzania. Furthermore, data collection was constrained by the availability and responsiveness of participants, which could have influenced the representativeness of the findings. The cross-sectional nature of the study also means that changes over time were not captured, and future longitudinal studies could provide deeper insights into how procurement practices evolve and impact lead time management.

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10. Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper. All efforts were made to ensure that the research process and the presentation of findings were objective and free from any external influences or biases that could compromise the integrity of the study. The views expressed in this paper are solely those of the authors and do not necessarily reflect the positions of the organizations or individuals involved.

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