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Examining causes of project delays in project management: A case study of Lusaka water supply and drainage project

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Abstract
Project delays are a major challenge in project management, leading to extended timelines, increased costs, and resource strain. This study, Examining Causes of Project Delays in Project Management: A Case Study of Lusaka Water Supply and Drainage Project, explores delay causes, their impact, and mitigation challenges. It investigates project decision-making processes, risk management strategies, delay causes, and financial implications. Key findings identify inadequate planning (28%) and poor communication (30.67%) as significant internal contributors, while external factors include environmental issues and political instability (32% each). Delays occurred most during execution and monitoring phases (62.66%), causing cost overruns for 41.33% of respondents, impacting budgets and resources. The delays significantly affected project success, with 32% reporting a high impact and 18.67% a moderate impact on outcomes. Mitigation challenges included insufficient expertise (26.67%) and inadequate training (13.33%). Contractor delays, poor scheduling, and substandard work also hindered completion. This research provides actionable insights for improving project planning, resource allocation, and communication, contributing to best practices that minimize delays and enhance success in infrastructure projects.

Keywords: Project delays, Lusaka water supply project, causes of delays, project management

1. Introduction
This chapter will focus on the, background of the study, problem identification, purpose, rationale, objectives identification and stating the significance of the study. In addition, the research will outline the theoretical framework.

1.1 Background
Project delays are a pervasive issue in project management, often resulting in significant financial losses, stakeholder dissatisfaction, and compromised outcomes. This problem is particularly pronounced in large-scale infrastructure projects, where complexities and uncertainties are high. The Lusaka Water Supply and Drainage Project in Zambia exemplifies these challenges, providing a pertinent case study for examining the causes of project delays.

The inability to execute projects on time and within budget is a major issue that continues to worsen. Cost and schedule overruns are common across various projects worldwide (Flyvbjerg, 2014; Doloi, 2016) [19, 17]. Factors contributing to these delays include poor project planning, inadequate risk management, financial constraints, and stakeholder conflicts (Kikwasi, 2017; Ismail, 2020) [23, 21]. Poor planning leads to unrealistic timelines and resource shortages, while inadequate risk management fails to anticipate potential issues. Financial constraints, such as delayed disbursements and budget overruns, halt progress and necessitate rescheduling. Stakeholder conflicts disrupt project timelines significantly.

In developing countries, project delays are further complicated by limited technical expertise, bureaucratic red tape, and insufficient infrastructure (Memon *et al*., 2014) [24]. Political instability and economic volatility exacerbate these challenges, leading to interruptions in project funding and execution. The Lusaka Water Supply and Drainage Project, initiated to improve critical infrastructure in Lusaka, Zambia, has faced several delays. Lusaka's rapid urbanization has outpaced infrastructure development, creating severe challenges in water

supply and drainage. The project aims to enhance water supply reliability, improve services, and mitigate flooding through upgraded drainage systems (World Bank, 2020) [32, 35].

Despite international support from organizations like the World Bank and the African Development Bank, which provide financial resources, technical assistance, and project oversight, the Lusaka project still faces significant hurdles (World Bank, 2020; African Development Bank, 2018) [32, 35, 1]. Effective community engagement is crucial to address local concerns, secure cooperation, and ensure that the benefits of the project are widely understood and appreciated.

The delays in the Lusaka Water Supply and Drainage Project highlight the multifaceted nature of project management challenges. By examining this case, we can identify primary causes of delays and propose strategies to mitigate them. This research will involve analyzing project documentation, conducting stakeholder interviews, and field observations to gain insights into the causes of delays. The findings will help refine project management practices, enhance risk management strategies, and foster better coordination among stakeholders.

1.2 Statement of the problem

Infrastructure projects like the Lusaka Water Supply and Drainage Project are crucial for urban populations, providing essential services such as clean water, improved sanitation, and flood mitigation. However, these projects often face significant delays and cost overruns, which undermine their success and efficiency. Delays can increase costs, strain stakeholder relations, and compromise project outcomes, ultimately impeding socio-economic benefits (Arditi & Pattanakitchamroon, 2016) [6]. Key causes of delays include poor project design and implementation, insufficient project finance, bureaucratic hesitancy, and lack of cooperation among stakeholders. Inadequate planning, insufficient feasibility studies, and inaccurate project assessments hinder effective risk management (Bertelsen & Kosamu, 2018) [9]. Funding constraints, disputes among contractors, changes in project scope, and unanticipated technical complexities further prolong timelines and erode confidence (Mwewa, 2019) [25]. To address these challenges, it is imperative to improve project planning and risk management, enhance stakeholder engagement, and implement effective dispute resolution mechanisms, thereby ensuring the successful completion of essential infrastructure improvements.

1.3 General objective

Examining causes of project delays in project management: case study of Lusaka water supply and drainage project.

1.4 Specific objectives

1. To establish primary causes of project delays in water supply and drainage project.
2. To Establish the extent to which project delay have impacted on project success.
3. To ascertain challenges faced in mitigating project delays.

1.5 Significance of the study

This study holds paramount significance for stakeholders involved in infrastructure development, particularly in water supply and drainage sectors. Its findings extend far beyond the specific context of the Lusaka Water Supply and Drainage Project, offering practical insights applicable to similar projects globally. For project managers and decision-makers, understanding the root causes of project delays and assessing existing management strategies enables proactive measures to prevent or mitigate delays. Policymakers benefit by making informed decisions on resource allocation and financing strategies to maximize returns and achieve sustainable development goals. Additionally, researchers and academics find value in contributing to the body of knowledge on project delays and management strategies, fostering continuous improvement in project delivery practices. Ultimately, the study aims to enhance infrastructure projects' efficiency, effectiveness, and sustainability, benefiting communities, economies, and the environment. By shedding light on delaying factors and offering actionable recommendations, it strives to improve urban life quality and foster inclusive, sustainable development globally.

1.5 Theoretical framework

The theoretical framework for this research combines Resource Dependency Theory (RDT) and Critical Chain Theory (CCT) to analyze and address the factors contributing to project delays in the Lusaka Water Supply and Drainage Project. These theories provide complementary perspectives on managing dependencies and critical activities to mitigate delays and enhance project outcomes.

RDT emphasizes the reliance of organizations on external resources to function effectively. In the Lusaka project, delays often arise from dependencies on funding, regulatory approvals, and material supplies. For instance, bureaucratic delays in securing permits or disruptions in material deliveries can significantly hinder progress. By applying RDT, project managers can focus on managing relationships with stakeholders such as donors, suppliers, and government agencies to secure timely access to essential resources. Addressing these dependencies is key to minimizing delays and ensuring smooth project execution.

CCT highlights the importance of identifying and managing the critical path of a project. For the Lusaka project, activities such as land acquisition, feasibility studies, and construction permits play a pivotal role in determining timelines. By integrating RDT and CCT, project managers can proactively mitigate risks, optimize resource allocation, and enhance resilience, ensuring timely completion and successful delivery of infrastructure services to the community.

2. Literature Review

2.1 Overview

In today's fast-paced, deadline-driven environment, time is frequently recognized as a critical benchmark for evaluating project performance, according to Farhad Eizakshiri, *et al.* (2015) [15]. Because the major goal of the project management principle is to complete the project on time, within budget, and according to the needed quality/specifications, construction time is frequently used as a benchmark for evaluating the performance of a project and the efficiency of project management. One indicator of a successful project was its completion on time.

Brown (2019) [12] emphasizes that communication is the backbone of successful project management. Miscommunication or lack of communication among team members, stakeholders, and clients can result in misunderstandings, errors, and delays. Establishing clear communication channels and regular updates ensures everyone is on the same page. The case of the Denver International Airport, discussed by Bruegman (1995) [11], illustrates how inadequate communication among contractors and the project team contributed to extensive delays and operational issues. Effective communication strategies involve regular meetings, transparent reporting systems, and the use of collaboration tools to facilitate information sharing. Poor communication can lead to misalignment of project objectives, uncoordinated efforts, and ultimately, project delays.

Chan (2008) [13] hold that the most important cause of delays in the construction sector is financing by the contractor during the project, changes in designs by the owner or his agent during the construction, delays in contractor‟s payment and non-utilization of professional construction management. In (2009) [30], Ravindra argued that investment in a constructed facility represents a cost in the short term that returns benefits only over the long term use of the facility. Thus, costs occur earlier than the benefits, and owners of facilities must obtain the capital resources to finance the costs of construction Pilcher, (2012) [29].

Bourne (2009) [10] highlights that project delays can lead to stakeholder dissatisfaction, impacting client relationships and the organization's reputation. Delays may cause inconvenience, financial loss, or missed market opportunities for clients and other stakeholders. This dissatisfaction can result in the loss of future business, negative publicity, and erosion of trust. In competitive industries, reputational damage due to delays can have significant consequences, affecting an organization's ability to secure new projects and maintain a positive market position. Therefore, timely delivery is not only a project management concern but also a strategic business imperative.

2.2 Personal critique of the literature review

Delays in project completion can have widespread consequences, ranging from cost overruns to negative social and environmental impacts. As outlined in previous studies, the root causes of project delays are often multifaceted, involving factors such as poor planning, inadequate financing, inefficient resource allocation, and communication breakdowns among key stakeholders (Olawale & Sun, 2010; Sambasivan & Soon, 2007) [27, 31]. While these causes have been consistently identified across various sectors, much of the literature generalizes these findings without a nuanced understanding of how delays manifest in specific project types like water supply and drainage, which present unique technical and logistical challenges. Projects in this sector often require the alignment of engineering expertise, environmental considerations, and public health goals, making them particularly susceptible to disruptions (Flyvbjerg *et al*., 2003) [18]. Yet, many studies fail to delve into the complexity of these dynamics, leaving a significant gap in the literature that this research seeks to address.

2.3 Establishment of research gaps

A significant limitation of existing research is that much of it focuses on developed countries or regions with well-established regulatory frameworks and project management systems, where the causes and consequences of delays differ from those experienced in developing nations (Sambasivan & Soon, 2007) [31]. For instance, while studies in developed contexts highlight factors like technological limitations and contract mismanagement, they often fail to account for the socio-political and institutional challenges that are prevalent in developing countries, such as Zambia (Frimpong *et al*., 2003) [20]. Specifically, the rapid urbanization of Lusaka, combined with limited resources and aging infrastructure, places additional pressure on the successful implementation of large-scale projects like water supply and drainage (Mutale, 2004) [26]. Despite the importance of these projects in ensuring public health and urban sustainability, there is a lack of detailed, localized studies that explore the primary causes of delays in this context.

3. Research Methodology

This chapter outlines the methodology for examining the causes of project delays in the Lusaka Water Supply and Drainage Project. A mixed-methods research design was employed, integrating both qualitative and quantitative approaches to provide a comprehensive analysis. The qualitative component involved in-depth interviews with key stakeholders—including project managers, engineers, contractors, local government officials, and residents—to gain insights into factors contributing to delays and the challenges encountered. Content analysis of relevant project documents supplemented these interviews (Creswell & Plano Clark, 2017) [14].

The target population comprised 75 key stakeholders directly involved in or affected by the project. For quantitative surveys, random sampling was employed to select respondents from the general population affected by the project. Data collection instruments included structured surveys and semi-structured interview guides. Surveys gathered quantitative data on demographic variables, project milestones, delay occurrences, and overall satisfaction with the project. Interviews provided rich qualitative data on planning, execution, challenges, and personal experiences related to the project. Content analysis was conducted on relevant documents to supplement primary data. Data analysis involved statistical techniques for quantitative data to identify correlations and trends, while qualitative data were thematically analyzed to identify significant themes.

To enhance validity and reliability, triangulation was employed by integrating data from multiple sources and methods. Ethical considerations were strictly observed, including obtaining informed consent from all participants, ensuring confidentiality and anonymity, and adhering to ethical guidelines set by institutional review boards. This comprehensive methodology aimed to provide an in-depth understanding of the factors contributing to project delays and their impact on project outcomes, allowing for valid inferences and meaningful conclusions.

4. Research findings and Discussions

4.1 Presentations of Results Based on the Demographic Information

The gender breakdown of respondents, as shown in Table 1, indicates a slight majority of male participants in the Lusaka Water Supply and Drainage Project. Out of 75 respondents, 60% (45 individuals) were male, while the remaining 40% (30 individuals) were female.

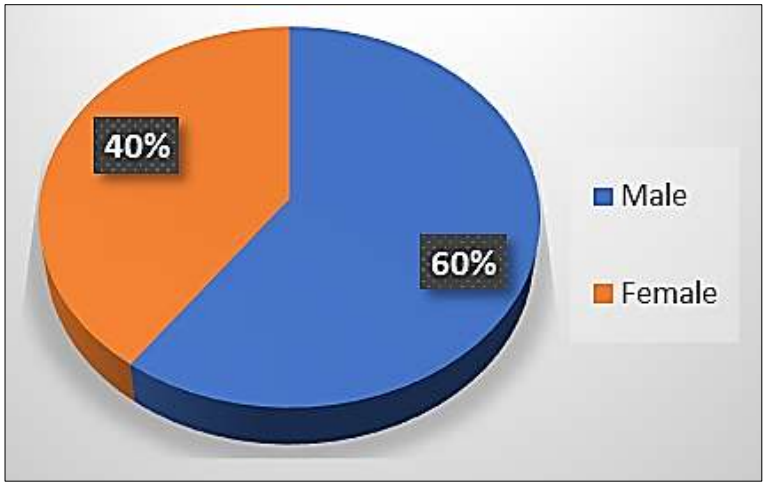

Fig 1: Gender

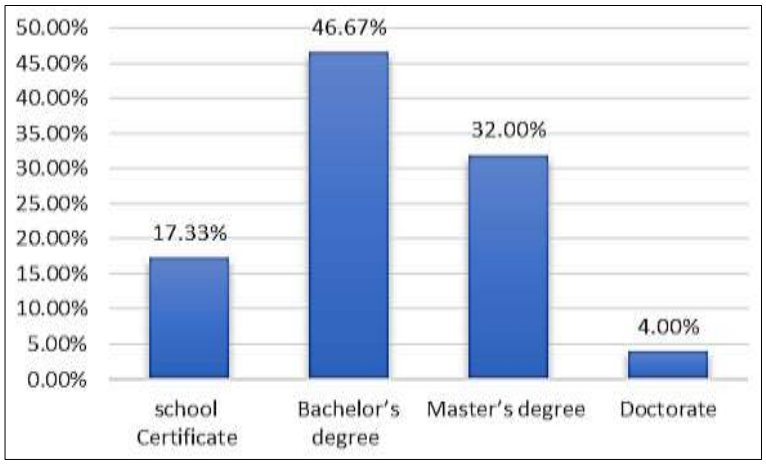

Fig 2: Highest level of Education

In terms of education, Table 2 reveals that the majority of respondents held higher education qualifications. A significant 46.67% (35 respondents) had obtained a Bachelor's degree, while 32% (24 respondents) held a Master's degree. Those with only a school certificate made up 17.33% (13 respondents), and 4% (3 respondents) had earned a Doctorate degree.

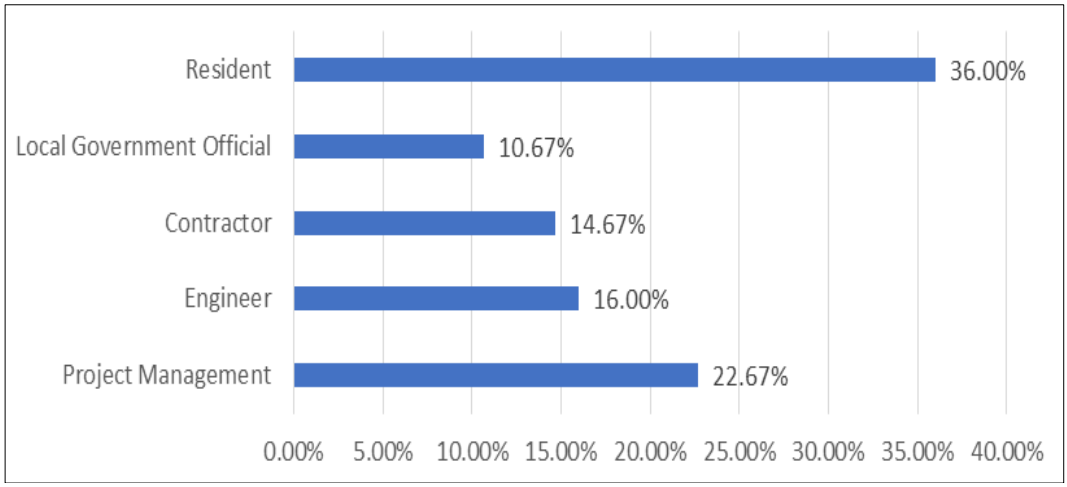

Fig 3: Occupation

The occupation of the respondents, as detailed in Fig 4, reveals a diverse range of involvement in the Lusaka Water Supply and Drainage Project. A notable 36% (27 respondents) were residents directly affected by the project. Among the professionals, Project Managers constituted 22.67% (17 respondents), Engineers made up 16% (12 respondents), Contractors accounted for 14.67% (11 respondents), and Local Government Officials comprised 10.67% (8 respondents).

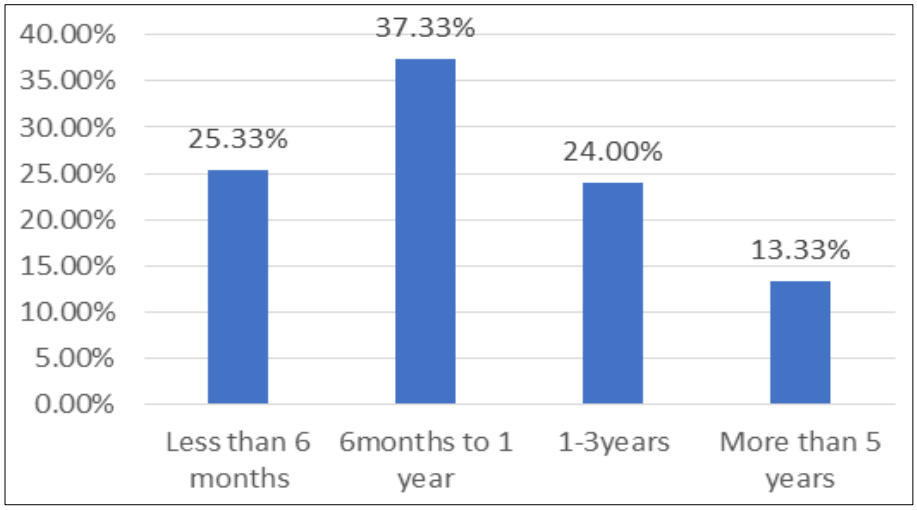

Fig 4: Length of Involvement in the Lusaka Water Supply and Drainage Project

As seen in Table 4.5, most respondents had relatively recent involvement with the project. The largest group, 37.33% (28 respondents), had been involved for 6 months to 1 year, while 25.33% (19 respondents) had participated for less than 6 months. Another 24% (18 respondents) had been involved for 1-3 years, and 13.33% (10 respondents) had been engaged for more than 5 years.

4.2 Presentations of Results Based on the Causes of Project Delays in Project Management

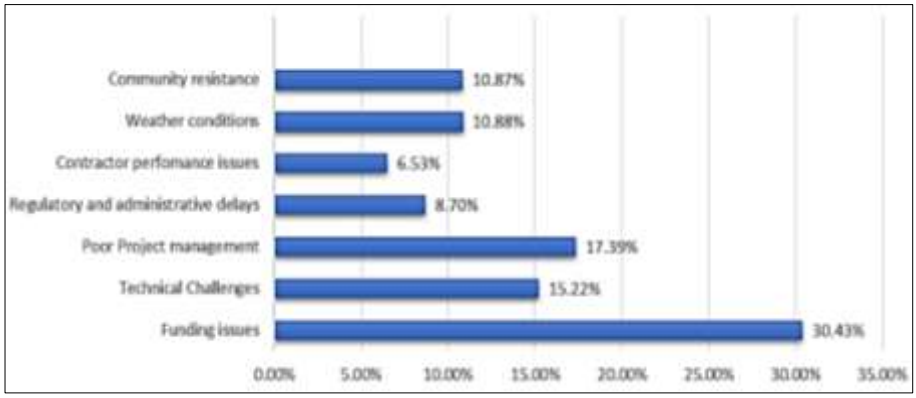

Fig 5: Primary Causes of Project Delays

Among those who believed delays occurred, respondents were asked to identify the primary causes of these delays, as shown in Table 4.7. The most frequently cited cause was funding issues, mentioned by 30.43% (14 respondents). This was followed by poor project management (17.39%, 8 respondents), and technical challenges (15.22%, 7 respondents). Other factors contributing to the delays included community resistance (10.87%, 5 respondents), weather conditions (10.88%, 5 respondents), regulatory and administrative delays (8.70%, 4 respondents), and contractor performance issues (6.53%, 3 respondents).

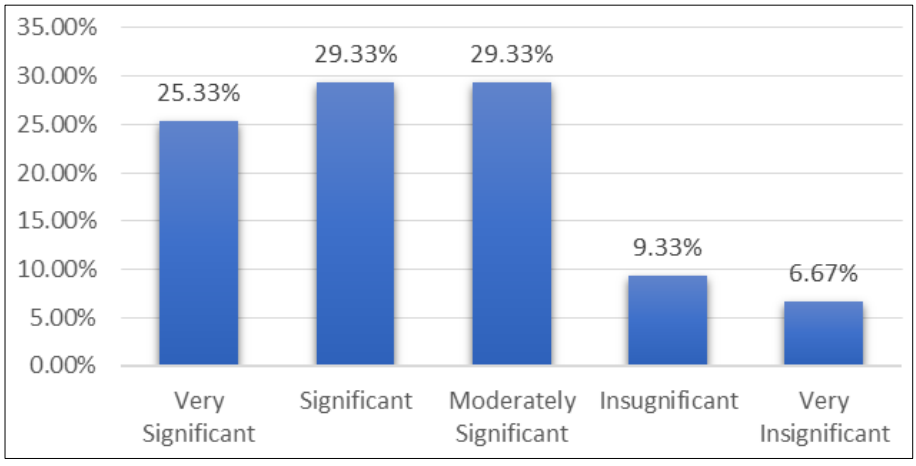

Fig 6: Significance of the Delays

When asked how significant they consider the delays, respondents provided varying perspectives, as presented in Table 4.8

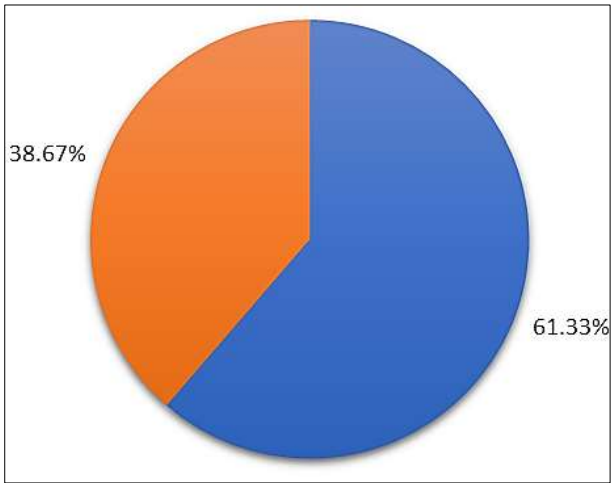

Fig 7: Impact of Project Delays on Completion of Milestones

According to Table 4.9, a majority of respondents, 61.33% (46 respondents), believe that project delays have significantly affected the completion of milestones in the Lusaka Water Supply and Drainage Project. However, 38.67% (29 respondents) did not believe that delays had a significant impact on milestones.

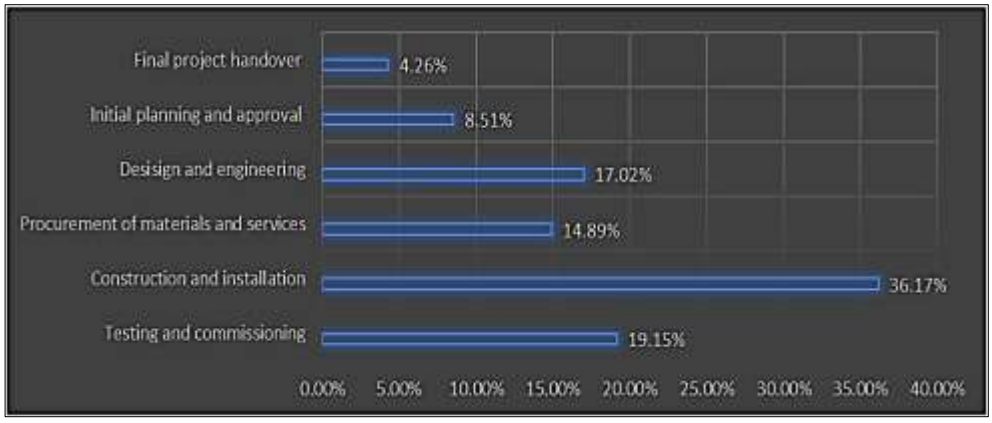

Fig 8: Project Milestones Most Affected by Delays

For those who acknowledged delays, Table 4.10 outlines the specific milestones most affected. These findings suggest that construction and installation, along with testing and commissioning, are the phases most vulnerable to delays, which can have significant ripple effects on the overall project timeline.

4.3 Presentation of results based on the extent to which project delay have impacted on project success

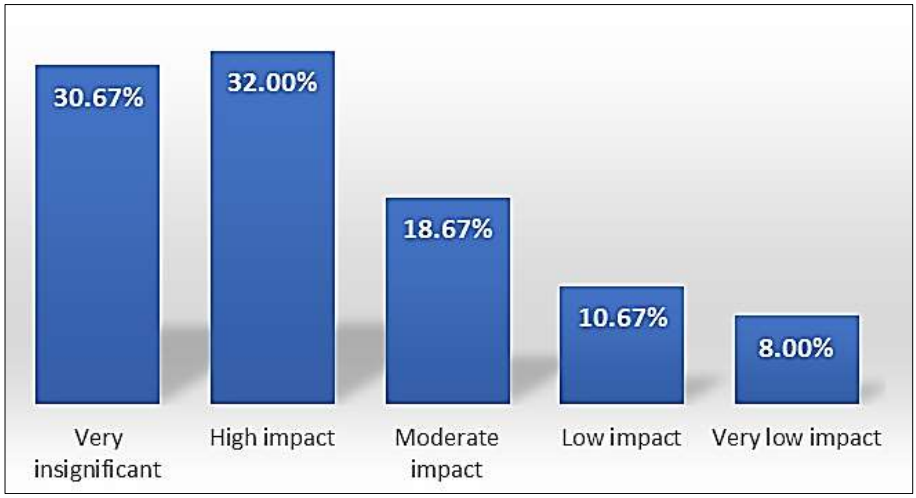

Fig 9: Impact of Delays on Project Success

When asked to assess the impact of the delays on the project's success, the responses, as shown in Table 4.18.

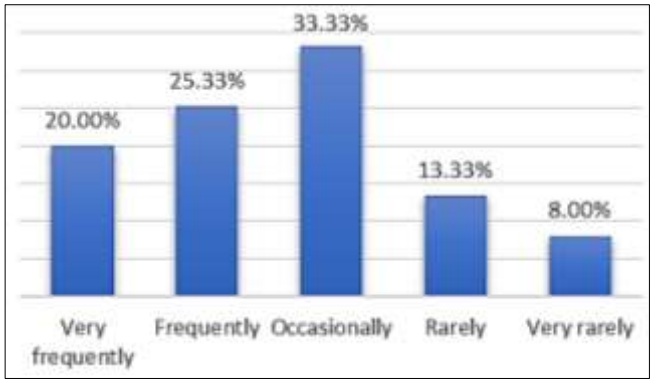

Fig 10: Frequency of Delays

Regarding the frequency of delays, as outlined in Table 4.19, 33.33% (25 respondents) felt that delays occurred occasionally, while 25.33% (19 respondents) believed they occurred frequently. Another 20% (15 respondents) thought delays occurred very frequently. On the opposite end, 13.33% (10 respondents) indicated that delays occurred rarely, and 8% (6 respondents) felt delays happened very rarely.

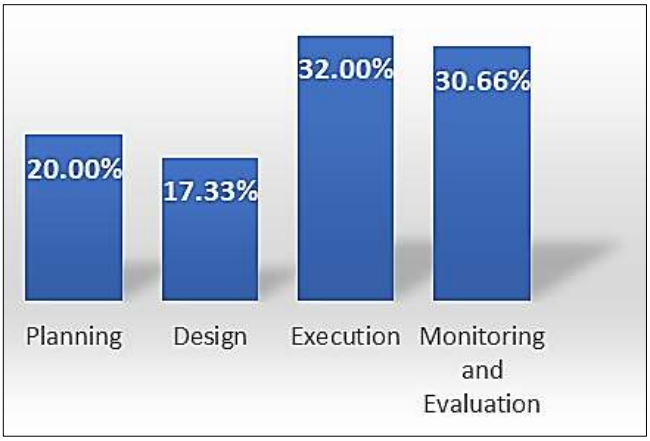

Fig 11: Phase of the Project Most Affected by Delays

According to the data in Table 4.20, respondents indicated that the execution phase of the Lusaka Water Supply and Drainage Project experiences the most delays, with 32% (24 respondents) selecting this phase. The monitoring and evaluation phase followed closely, with 30.66% (23 respondents) identifying it as the phase most affected by delays. The planning phase was chosen by 20% (15 respondents), and 17.33% (13 respondents) cited the design phase.

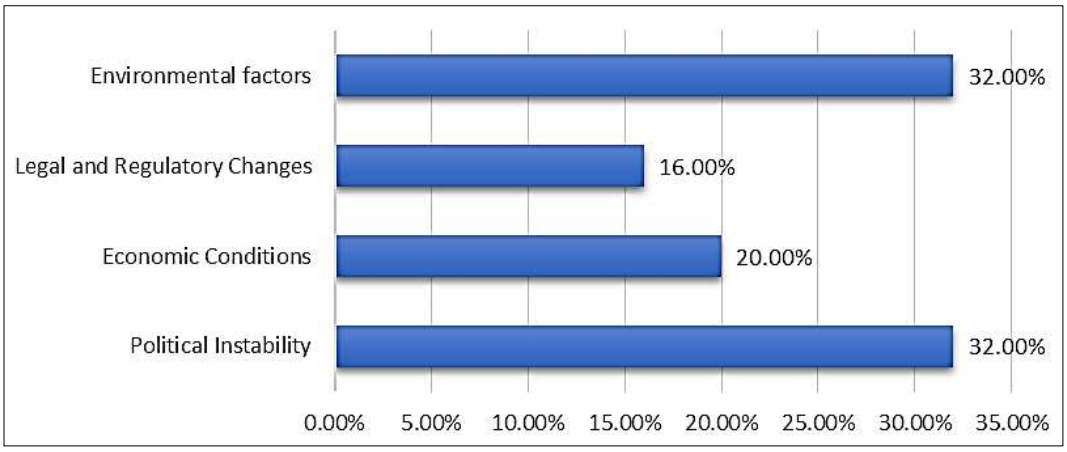

Fig 12: Common External Factors Contributing to Project Delays

The external factors contributing to delays, as shown in Table 4.21, are diverse. Environmental factors were the most commonly cited, with 32% (24 respondents) identifying them as a cause. Political instability followed, being selected by 32.00% (24 respondents), while economic conditions contributed to delays according to 20% (15 respondents). Legal and regulatory changes were also significant, affecting 16% (12 respondents).

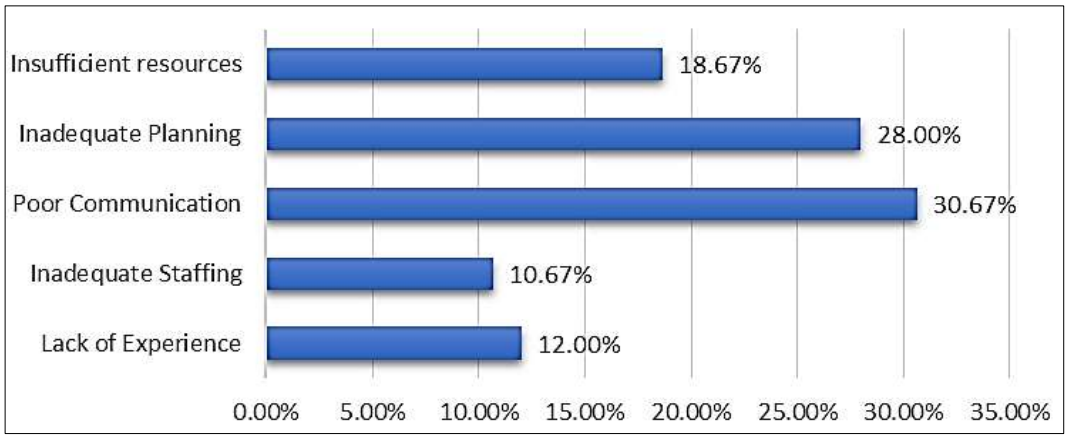

Fig 13: Internal Factors Contributing to Delays

Regarding internal factors within the project management team, Table 4.22 reveals that poor communication was the most cited issue, with 30.67% (23 respondents) identifying it as a cause of delays. This suggests that internal communication and planning issues within the project team are seen as key contributors to delays, alongside other managerial challenges.

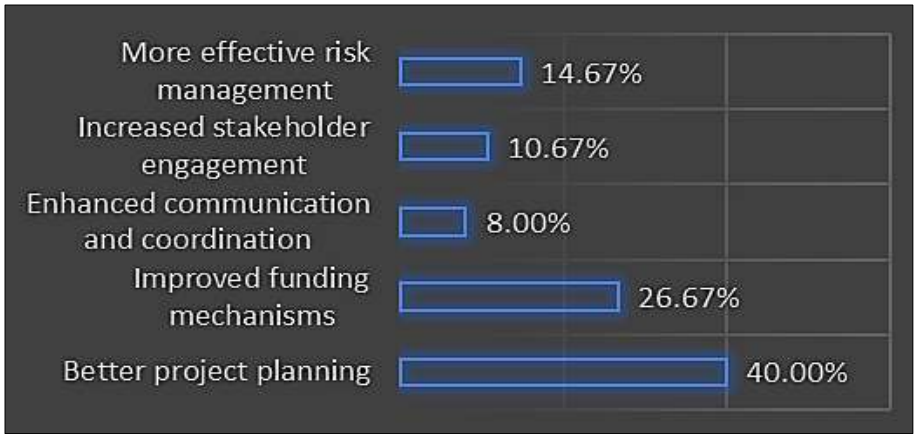

Fig 14: Strategies to Mitigate Project Delays

The respondents offered various strategies to mitigate the causes of project delays, as shown in Table 4.23. This mixed feedback suggests that while a substantial portion of stakeholders are satisfied with how delays are managed, a significant minority believe there is room for improvement in handling delays when they occur.

4.4 Presentations of Results Based on the Challenges Faced in Mitigating Project Delays

Fig 15: Internal Factors Hindering Delay Mitigation

The data in Table 4.25 reveals that the most common internal factor hindering the mitigation of delays was a lack of experienced personnel, identified by 26.67% (20 respondents). These findings highlight the need for better expertise, communication, and tools to address internal challenges in delay mitigation.

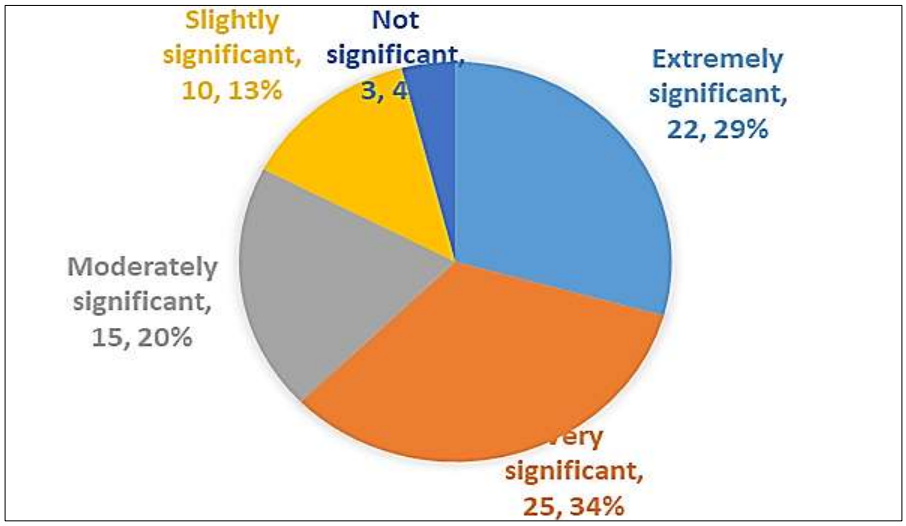

Fig 16: Impact of Limited Resources on Mitigating Delays

As shown in Table 4.26, limited resources were considered highly impactful in mitigating delays. These results emphasize the critical role of adequate resources in mitigating project delays.

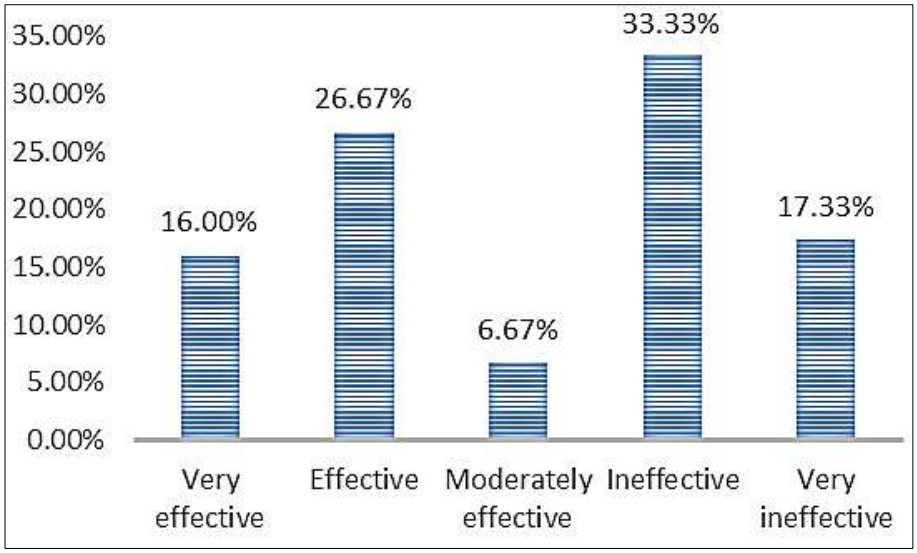

Fig 17: Effectiveness of Current Risk Management Strategies

According to Table 4.28**,** only 16% (12 respondents) rated the current risk management strategies as very effective, while 26.67% (20 respondents) found them effective. The majority, 33.33% (25 respondents), believed the strategies were moderately effective. However, 17.33% (13 respondents) considered them ineffective, and 6.67% (5 respondents) felt they were very ineffective.

Fig 18: Challenges in Implementing Risk Management Strategies

As detailed in Table 4.29, the most cited challenge in implementing risk management strategies was insufficient training, identified by 26.67% (20 respondents). Lack of resources followed at 24% (18 respondents), and poor communication and coordination accounted for 20% (15 respondents). Inadequate monitoring and review processes affected 16% (12 respondents), while stakeholder resistance was noted by 10.67% (8 respondents). Other factors accounted for 2.67% (2 respondents).

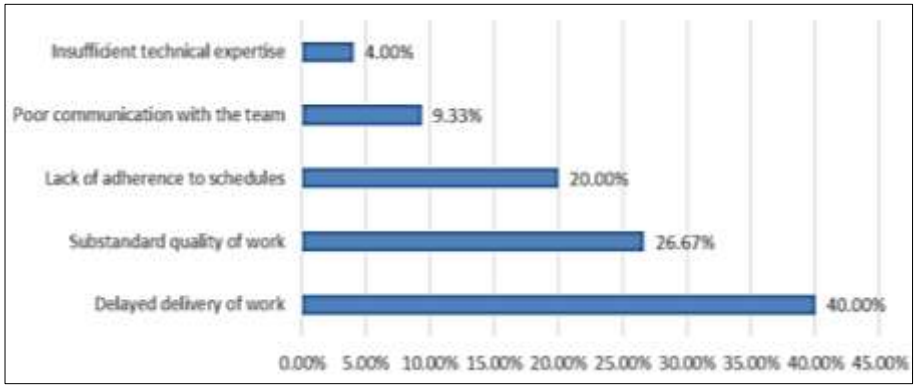

Fig 19: Challenges with Contractor Performance

As shown in Table 4.31, delayed delivery of work was the most significant challenge with contractor performance, cited by 40% (30 respondents). Substandard quality of work affected 26.67% (20 respondents), while lack of adherence to schedules impacted 20% (15 respondents). Poor communication with the project team and insufficient technical expertise were noted by 9.33% (7 respondents) and 4% (3 respondents), respectively. These results highlight the need for improved contractor management to ensure timely and quality delivery.

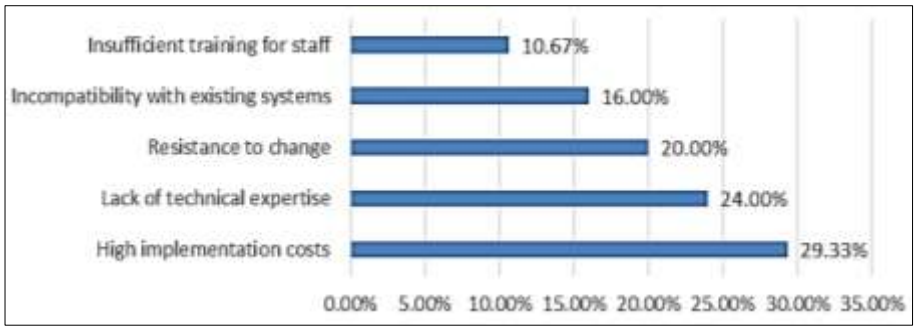

Fig 20: Obstacles in Adopting New Technologies

In Table 4.33, the most significant obstacle to adopting new technologies was high implementation costs, identified by 29.33% (22 respondents). Lack of technical expertise followed at 24% (18 respondents), while resistance to change accounted for 20% (15 respondents). Incompatibility with existing systems was cited by 16% (12 respondents), and insufficient training for staff was noted by 10.67% (8 respondents). These findings suggest that addressing cost and expertise barriers is critical for adopting new technologies to mitigate delays.

Table 1: Recommended Improvements to Overcome Challenges

Recommendations	Freq.	Percent
Increase funding and resource allocation	25	33.33%
Enhance training and capacity building	20	26.67%
Improve communication and coordination	15	20.00%
Streamline regulatory processes	10	13.33%
Strengthen contractor management	5	6.67%
Total	75	100.00%

As detailed in Table 4.34, the most frequently recommended improvement was increasing funding and resource allocation, selected by 33.33% (25 respondents). Enhanced training and capacity building were suggested by 26.67% (20 respondents), while improving communication and coordination was noted by 20% (15 respondents). Streamlining regulatory processes was recommended by 13.33% (10 respondents), and strengthening contractor management was cited by 6.67% (5 respondents). These recommendations highlight the need for comprehensive improvements in resource management, training, and communication.

4.5 Discussion of Research Findings

The Lusaka Water Supply and Drainage Project experienced delays due to funding issues, poor project management, technical challenges, stakeholder resistance, and regulatory hurdles. Funding problems were the most significant, with 30.43% of respondents attributing delays to insufficient financial resources, consistent with Pinto's (2019) [28] findings on the prevalence of funding-related delays. Poor project management, cited by 17.39%, reflected deficiencies in scheduling and risk management, aligning with Ajam and Al-Sheikh's (2010) [4] studies. Technical challenges during the design and engineering phases (15.22%) were similarly consistent with Zwikael and Globerson's (2006) emphasis on the impact of technical complexities. Stakeholder resistance (10.87%) and regulatory delays (8.7%) further compounded issues, underscoring the need for better communication and streamlined administrative processes. These findings highlight the multifaceted nature of delays and suggest prioritizing funding security, stakeholder engagement, and regulatory efficiency to mitigate future delays.

Project delays had varying impacts on success, with 32% of respondents perceiving a high impact and 30.67% reporting an insignificant impact. Execution and monitoring phases were the most delay-prone, cited by 32% and 30.66% of respondents, respectively, consistent with Zwikael and Globerson's (2006) [33] findings on resource and technical challenges during critical project phases. External factors such as political instability (32%) and economic conditions (20%) were major contributors to delays, alongside internal issues like poor communication (30.67%) and ineffective planning (28%). Effective strategies to address delays included improved project planning (40%) and enhanced funding mechanisms (26.67%), reinforcing Ajam and Al-Sheikh's (2010) [4] emphasis on strategic planning and financial stability. These findings suggest that delays, while detrimental, can be mitigated with targeted improvements in project management and resource allocation.

Mitigating delays faced internal challenges like insufficient experience (26.67%) and poor communication (24%) and external barriers such as regulatory constraints (62.66%) and resource limitations (62.66%). Inadequate training (13.33%) and limited adoption of advanced management tools (20%) further hindered efforts, echoing Pinto's (2019) [28] emphasis on capacity building. Risk management strategies were rated as only moderately effective by 33.33%, with 24% finding them ineffective, highlighting gaps in implementation and monitoring. Contractor issues, including delayed delivery (40%) and substandard work (26.67%), further compounded delays. Stakeholder engagement proved beneficial, with 37.33% citing its effectiveness, though 16% noted significant gaps.

5. Conclusion and Recommendation

5.1 Conclusion

The study on the Lusaka Water Supply and Drainage Project highlights several key factors contributing to project delays

and their impact on overall success. Funding constraints and inadequate project management emerged as significant internal challenges, while environmental conditions, regulatory delays, and political instability were critical external factors. These delays extended project timelines and disrupted key milestones, particularly during execution and monitoring phases. Regulatory processes and supply chain disruptions created bottlenecks in the planning and procurement stages, while environmental conditions, such as adverse weather, complicated construction efforts. The findings emphasize the importance of incorporating external risk factors into early project planning and addressing them proactively through strategic partnerships and contingency measures.

Delays were found to significantly impact project success, particularly during the implementation phase, where setbacks were most frequent. Internal challenges, including insufficient training, lack of experienced personnel, and poor communication, compounded the delays, while external barriers such as regulatory hurdles, resource limitations, and contractor inefficiencies created further obstacles. Current risk management strategies were often viewed as insufficient, signaling a need for more proactive and effective approaches.

5.2 Recommendation

Based on the study's findings, it is recommended to enhance initial planning and risk assessment by conducting comprehensive risk analyses and incorporating contingency plans to anticipate and address potential challenges. Improving contractor selection and management processes through rigorous evaluations, clear performance metrics, and accountability measures will ensure contractors meet project standards and timelines. Investing in technical training and capacity building for project staff will equip them to handle complex tasks efficiently, reducing technical setbacks. Additionally, allocating adequate resources and maintaining financial flexibility by securing sufficient budgets and establishing buffer funds will prevent disruptions from funding shortages and unforeseen expenses. Implementing these strategies will help minimize delays and improve the efficiency and timeliness of the Lusaka Water Supply and Drainage Project, as well as similar future infrastructure projects, by promoting proactive planning, effective resource allocation, continuous communication, and adaptable project management practices.

6. References

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