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Examining the Effectiveness of Risk Management Processes in Enhancing Project Completion and Overall. Case Study of ZAMTEL 5G Digital Project

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Abstract: This study investigates the effectiveness of risk management processes in enhancing project completion and overall success in Zambia's IT sector, using ZAMTEL's 5G Digital Project as a case study. Grounded in PMBOK and Prospect Theory, the study employs a mixed-methods design, combining quantitative surveys (n=50) with qualitative interviews (n=25) to address three objectives: identifying predominant risk practices, evaluating their effects on completion, and ascertaining the relationship between processes and success.

Findings indicate moderate adoption of qualitative practices like risk identification via brainstorming (mean 4.1) and stakeholder engagement (mean 4.0), but low use of quantitative analysis (mean 2.8) and fuzzy techniques (mean 2.9). These practices positively affect completion by reducing delays (mean 4.2) and cost overruns (mean 4.0), though inadequate management leads to rework (mean 4.3). The relationship is strong but moderated by leadership (mean 4.1-3.78, 70-72% agreement), organizational culture (mean 3.9), and external factors like political instability (mean 4.3), with Prospect Theory explaining loss-averse decisions (mean 3.5-3.6). Weak monitoring (mean 3.6-2.94) limits feedback loops (mean 3.28, 50% agreement), contributing to ZAMTEL's challenges, such as funding-related delays in 35 sites.

The study concludes that while risk management enhances outcomes potentially cutting costs by 10-14% gaps in maturity and localization hinder full efficacy in Zambia's uncertain environment. Recommendations include advanced training, strengthened monitoring, leadership engagement, and hybrid frameworks to boost resilience. This research fills a gap in African-focused studies, offering practical insights for policymakers and practitioners to improve IT project success amid regional risks.

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I. INTRODUCTION

➢ *Background of the Study*

Globally, project management entails addressing multifaceted challenges such as resource limitations, stakeholder demands, and external uncertainties, where risks can severely hinder progress (Bruan & Clarke, 2006). Effective risk management is therefore crucial for delivering projects on time, within budget, and to quality standards, as demonstrated by international studies indicating that robust risk planning benefits industries like construction and engineering worldwide (ISO, 2018). In dynamic global environments, risks stem from economic, cultural, political, and organizational factors, with mismanagement leading to substantial financial losses and high failure rates across sectors. Abbsapour (2013) citing historical data shows that projects incorporating integrated risk processes perform better, underscoring the importance of systematic identification, assessment, and response to threats and opportunities.

Furthermore, risk management is recognized globally as a cornerstone of project success, with frameworks like the Project Management Body of Knowledge (PMBOK) outlining structured processes to identify, analyse (qualitatively and quantitatively), respond to, and monitor risks. Studies such as (Banti & Mishra, 2025) indicate that effective risk management can reduce project costs by an average of 14% and accelerate completion times by 10%, particularly in high-stakes industries such as IT, construction, and engineering. For instance, multinational analyses across industries and countries reveal that proactive risk planning significantly lowers failure rates, with tools like risk matrices, Monte Carlo simulations, and

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SWOT analyses being widely adopted for their association with improved outcomes (Alsaadi & Norhayatizakuan, 2021).

Regional studies such as World Bank (2023) emphasize the need for context-specific frameworks, particularly in public sector and infrastructure projects, where risks such as fraud, corruption, and weak regulatory environments undermine effectiveness. For government healthcare infrastructure, challenges include financial constraints, technical issues (e.g., unreliable internet), stakeholder resistance, cultural barriers, and political interference, leading to high failure rates if not addressed. Proposed solutions involve innovative financing (e.g., public-private partnerships or PPPs), technology adoption (e.g., Building Information Modeling or BIM), and standardized tools like ISO 31000 or PMBOK, adapted to African contexts (Sikanyika & Kilvin, 2025). According to Resnik (2018) Sub-Saharan Africa's public sector faces additional hurdles, including limited expertise and ineffective PPP arrangements, which exacerbate risks in projects like roads and energy initiatives, often resulting in abandonment and cost overruns estimated at billions. A PMI report notes that political upheaval (e.g., in North Africa) and infrastructure risks (e.g., power outages reducing productivity by 40%) necessitate robust contingency planning and local talent development to enhance risk mitigation.

Shimwambwa (2020) notes that in financial and SME landscapes, risk management practices are evolving but remain underdeveloped, with calls for enhanced governance and knowledge sharing to improve project outcomes. Regional effectiveness is thus limited by resource gaps, but studies show that integrated approaches, including stakeholder engagement and cultural contingency, can mediate risks and foster sustainable performance. This perspective underscores Africa's potential for growth through better risk management, though only 13.5% of global studies focus here, indicating a research gap (Phiri & Tondolo, 2020).

Narrowing to developing countries, these risks are exacerbated by limited resources and institutional capacities, particularly in Africa where economic sanctions and cultural variances intensify uncertainties. In Zambia, a landlocked developing nation reliant on mining and agriculture, project risks are further compounded by infrastructural gaps, foreign exchange volatility, and governance issues, as evidenced by studies on local construction and public-private partnership (PPP) projects where risk mismanagement has led to delays and cost overruns (Tembo-Silungwe and Khatleli, 2017; Mwanaumo et al., 2020). Zambian projects, especially in construction and IT, benefit from adopting global best practices but require localization to address context-specific challenges like regulatory inconsistencies and skill shortages.

➢ *Statement of the Problem*

Globally, despite standardized risk management frameworks, projects frequently fail due to poor risk identification and mitigation, resulting in cost and schedule overruns, diminished quality, and unfulfilled stakeholder expectations. Empirical data from sectors like software development and construction globally reveals that reactive approaches worsen problems in uncertain settings influenced by cultural and economic factors (Musosha & Kelvin, 2025). This is aggravated by insufficient ongoing monitoring, causing preventable disruptions and overlooking risk interdependencies that impede success. In developing regions, Mwansa and Mwaanga (2019) notes that these issues are more pronounced due to resource constraints and external pressures. Locally in Zambia, the problem is acute, with many projects in IT, construction and infrastructure suffering from ineffective risk handling, leading to frequent abandonments, disputes, and economic losses amid political instability and supply chain vulnerabilities (Ngosa & Chibomba, 2025). This study therefore seeks to address this gap in evaluating and understanding how effective risk management processes correlate with project completion in Zambia, where current practices often neglect localized risk interrelations, hindering overall project success

➢ *General Objective*

The main objective of the study is examining the effectiveness of risk management processes in enhancing project completion and overall success, with a focus on Zambia's IT sector.

- *Specific Objectives*

✓ Establish the types of risk management practices used in project management in Zambia's IT sector.
✓ Evaluate the effects of risk management processes on project completion.
✓ Ascertain the relationship between effective risk management processes and project completion.

➢ *Research Questions*

- What are the predominant types of risk management practices employed in project management in the IT sector in Zambia?
- What effects do risk management processes have on the completion of IT projects in Zambia?
- What is the nature of the relationship between effective risk management processes and successful project completion in the Zambian setting?

➢ *Theoretical/Conceptual Framework*

The theoretical framework of this study is anchored in the Project Management Body of Knowledge (PMBOK) Risk Management Process, a structured methodology designed to handle uncertainties throughout the project lifecycle. As outlined in the PMBOK Guide cited by Donald (2021), this process comprises seven key processes in its latest edition, but traditionally emphasizes six core steps for effective risk handling: (1) plan risk management, which involves defining how risk activities will be conducted, including methodologies, roles, and budgeting; (2) identify risks, where potential threats and opportunities are documented using tools like expert judgment, data gathering, and interpersonal skills; (3) perform qualitative risk analysis, prioritizing risks based on probability and impact through techniques such as risk probability and impact assessment; (4) perform quantitative risk analysis, quantifying risk exposure using methods like sensitivity analysis, expected monetary value, and decision tree analysis; (5) plan risk responses, developing strategies to address risks,

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such as escalate, avoid, transfer, mitigate for threats, or exploit, share, enhance, accept for opportunities; (6) implement risk responses, executing the agreed-upon plans with assigned owners; and (7) monitor risks, which ensures ongoing review, tracking triggers, and auditing the effectiveness of responses (Abbaspour, 2013). This framework promotes a proactive stance, integrating risk considerations into all project knowledge areas to minimize deviations from objectives and maximize value delivery. Empirical applications demonstrate that adherence to these steps can reduce project failure rates by enhancing foresight and resource allocation, particularly in volatile settings where uncertainties are prevalent.

Complementing the PMBOK process is Prospect Theory, a behavioral economics model that elucidates how individuals evaluate potential outcomes under risk, deviating from traditional expected utility theory. Developed by Kahneman and Tversky, the theory posits that decision-makers exhibit loss aversion, weighing potential losses more heavily than equivalent gains typically twice as much and evaluate choices relative to a reference point rather than absolute outcomes (Bruan & Clarke, 2006). In project management, this manifests as managers being more inclined to avoid risks that could lead to losses (e.g., budget overruns or delays) than to pursue equivalent gains (e.g., early completion bonuses), often resulting in conservative strategies during uncertainty. The theory's value function is concave for gains and convex for losses, with a steeper slope in the loss domain, explaining phenomena like the certainty effect (preferring sure outcomes) and the isolation effect (framing influences choices) (Donald, 2021). This psychological lens enhances PMBOK's rational processes by accounting for cognitive biases in risk prioritization and response selection, such as overemphasizing low-probability high-impact event or undervaluing incremental improvements.

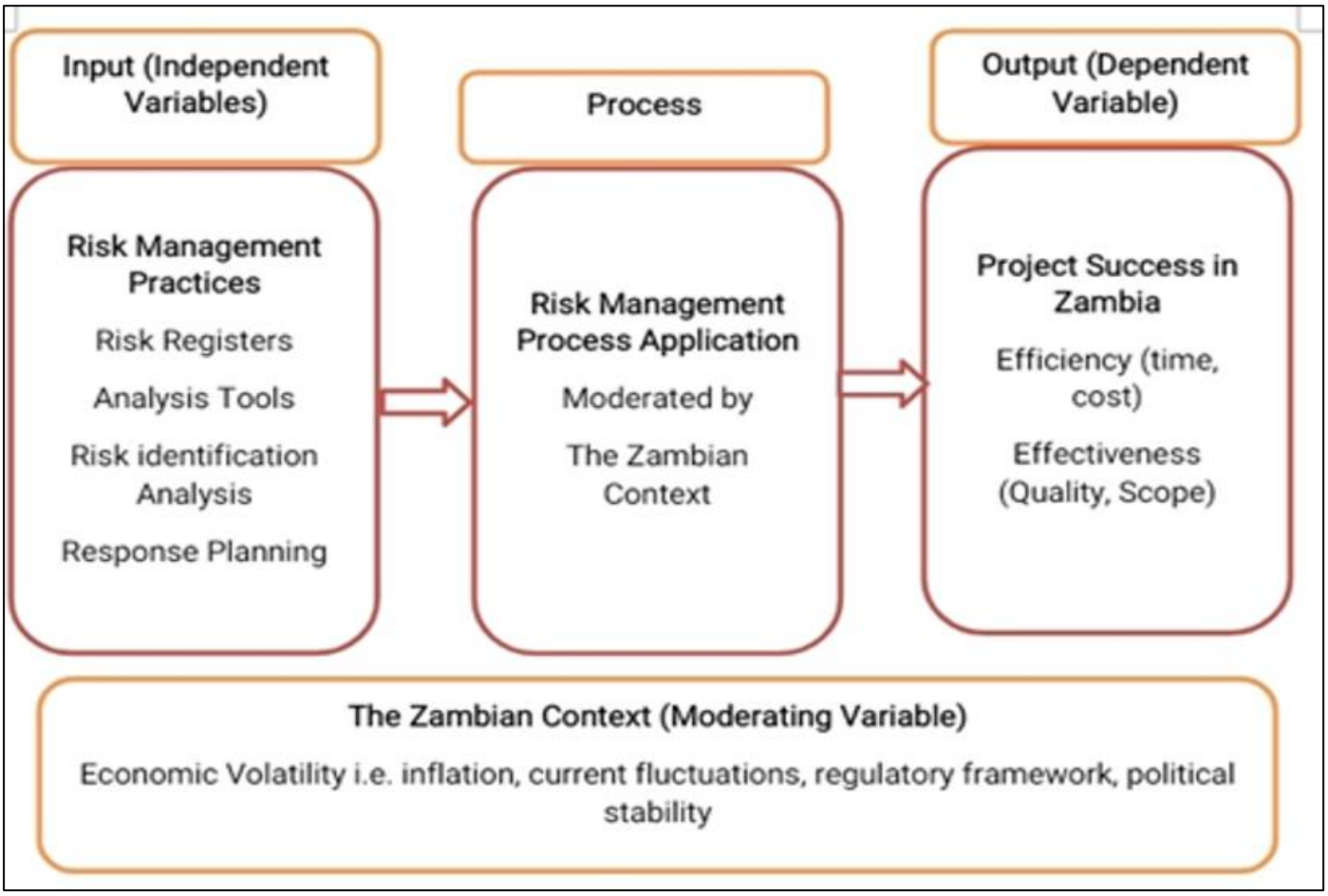

Fig 1 Conceptual Framework

The conceptual framework builds on these theories to illustrate the causal relationships among variables, conceptualizing risk management as an input-process-output model moderated by the Zambian context. Inputs encompass risk management practices, including registers for tracking identified risks and analysis tools like probability-impact matrices or Monte Carlo simulations for assessment. These feed into the process stage, where risk management application encompassing the full PMBOK cycle from planning to monitoring transforms inputs into actionable strategies, moderated by Zambian-specific factors such as economic volatility (e.g., inflation and currency fluctuations) and the regulatory environment, which can amplify or attenuate process effectiveness. Outputs are bifurcated into project success dimensions: efficiency (measured by time and cost adherence) and effectiveness (evaluated through quality and scope fulfillment), reflecting the iron triangle extended to include performance sustainability.

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➢ *Significance of the Study*

In Zambian context, this study offers evidence-based insights for optimizing risk processes to improve completion rates, reducing failures and enhancing efficiency. Organizations worldwide can refine policies to cultivate risk-aware cultures. Further, the study findings will aid project managers in construction and IT by addressing local risks, potentially lowering overruns and supporting economic growth through better infrastructure delivery. Academically, it enriches literature on risk efficacy in developing contexts, providing a model for Zambian research. Policy makers can promote standardized practices to foster sustainable development**.**

➢ *Scope of the Study*

The study encompasses local perspectives on risk management to projects in Zambia's construction and IT sectors, where risks like political instability and economic uncertainty prevail. It reviews completed projects over the past five years from 2020-2025 focusing on medium-to-large initiatives with budgets over $1 million executed in Lusaka. Small-scale or non-profit projects are excluded, with data collection limited to English-speaking respondents in Zambia for feasibility.

II. LITERATURE REVIEW

Overview of this chapter reviewed various literature studies from global, regional, sub-Sahara, Zambia and Lusaka district the project perspectives based on the specific objectives. By analysing the literature, the researcher was able to identify research gaps that had been overlooked and then offered some criticism on the literature examined, which could then be filled.

➢ *Predominant Types of Risk Management Practices Employed in Project Management in the IT and Construction Sector in Zambia*

Effective risk management processes play a pivotal role in ensuring the timely completion and overall success of projects across various industries and contexts. By systematically identifying, analyzing, responding to, and monitoring uncertainties, these processes help mitigate potential threats that could derail project objectives, such as meeting deadlines, staying within budget, and achieving desired quality outcomes. In an increasingly complex global business environment characterized by compressed schedules, uncertain budgets, and evolving stakeholder requirements, risk management emerges as a strategic tool for enhancing project resilience and performance. This review synthesizes insights from diverse studies to explore how risk management contributes to project success, drawing on theoretical underpinnings, practical applications, and contextual variations. It highlights the integration of rational and communicative actions in risk handling, the categorization of uncertainties, and the need for tailored strategies to address epistemic and aleatoric risks, ultimately fostering sustainable project outcomes (Zwikael and Ahn, 2011; de Bakker et al., 2010; Rodríguez-Rivero et al., 2020).

The literature underscores that risk management is not merely a technical exercise but a multifaceted process that aligns with organizational goals and external dynamics. For instance, in development and construction sectors, it addresses not only immediate threats but also long-term sustainability, incorporating indigenous perspectives and environmental considerations to enhance community impacts (Rodríguez-Rivero et al., 2020; Tembo-Silungwe and Khatleli, 2017). As projects face growing uncertainties from economic fluctuations, regulatory changes, and stakeholder expectations, effective risk processes become essential for transforming potential failures into opportunities for value creation. This review examines theoretical backgrounds, key concepts, impacts on completion, influencing factors, and practical implications, revealing how robust risk management can elevate project success rates while adapting to diverse environments.

Empirical studies on risk management in project delivery have increasingly highlighted its role in mitigating uncertainties that affect project outcomes, particularly in global and sub-Saharan contexts where economic volatility, institutional weaknesses, and cultural factors amplify risks. Globally, research underscores the moderating effect of risk management on project performance, while in sub-Saharan Africa, studies reveal context-specific challenges like governance issues and resource constraints that undermine risk handling. This literature review synthesizes research on project risk management and its influence on project completion and success. It proceeds from global conceptual and empirical evidence to regional African studies and then focuses on the Zambian context.

III. RESEARCH METHODOLOGY

➢ *Overview*

This chapter outlines the study's research design as well as the numerous methods and techniques that will be used to gather and analyze the data. This chapter describes the research design, target population, sample size, sampling procedures, data collection methods, data analysis, triangulation, limitation of the study and ethical consideration that will be used for the study as well as the several methods and procedures that will be used to collect and analyze the data. Specifically, the methodology and instruments used for data analysis in the study.

➢ *Research Design*

The study will employ an exploratory mixed-methods design, combining both quantitative and qualitative techniques to provide a holistic assessment of risk management practices. A mixed-methods approach has been considered appropriate because it will allow the researcher to draw on the strengths of both paradigms, overcoming the limitations inherent in using a single method (Johnson & Onwuegbuzie, 2004). The quantitative component of the study will rely on structured surveys designed to measure the prevalence and statistical relationship between risk management practices and project success. This approach draws from the Project Management Body of Knowledge guide, which emphasizes systematic risk identification, assessment, and control as key pillars of effective project management (PMI, 2021).

The qualitative component will involve semi-structured interviews with project managers, team members, and key stakeholders. This strand seeks to capture lived experiences, perceptions, and contextual insights on how risk management is practiced in Zambia. In an environment where informal

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practices and adaptive strategies are often employed to mitigate uncertainty, qualitative exploration was considered critical for generating depth (Mwansa & Mwaanga, 2019).

The mixed-methods design further incorporates the potential application of fuzzy-based analytical techniques such as fuzzy DEMATEL and the Analytic Network Process (ANP). These decision-making tools are particularly useful in addressing the subjectivity and uncertainty inherent in risk assessment, and they have been successfully applied in construction and IT-related studies in emerging economies (Zhang & Fan, 2014; Li et al., 2020).

- *Target Population*

The target population for this study will consist of project managers, project team members, consultants, and other stakeholders working within Zambia's IT and Construction sectors. These groups will be selected because they play direct roles in risk identification, assessment, and mitigation throughout the project life cycle. The inclusion criteria requires participants to have a minimum of five years of professional experience in project management, which will be considered adequate to provide informed insights into the effectiveness of risk management practices.

The population size is estimated at approximately 5,000 professionals, based on membership data obtained from professional associations such as the Project Management Institute (PMI) Zambia Chapter, the Engineering Institution of Zambia (EIZ), and the ICT Association of Zambia (ICTAZ) as well as National Council For Construction (PMI Zambia, 2023; EIZ, 2022). This population forms the basis for the determination of the quantitative sample size.

- *Sampling Design*

A two-stage sampling strategy will be adopted to accommodate both the qualitative and quantitative components of the study. For the qualitative strand, purposive sampling will be employed to select informants with significant experience in project risk management. Purposive sampling is widely recognized as a suitable method for qualitative research as it ensures that participants possess the depth of knowledge necessary to provide meaningful insights (Etikan, Musa & Alkassim, 2016).

For the quantitative strand, stratified random sampling will be used to select survey respondents. Stratification will be based on sector (IT and Construction), role (managerial versus operational), and organizational size, ensuring balanced representation across key subgroups. This method will be chosen because it reduces sampling error and improves representativeness, particularly in studies involving heterogeneous populations (Sekaran & Bougie, 2019). This approach is consistent with global and regional risk management studies which emphasize the importance of sectoral and role-based representation (Kikwasi, 2012; Mhlanga & Mudzengerere, 2014).

- *Sample Size Determination*

The quantitative survey sample size was determined using Yamane's (1967) formula for sample size calculation, which is expressed as:

$$n = \frac{N}{1 + N(\alpha)^2}$$

N is the sample frame where *n* represents the sample size, *N* the population size, and *e* the level of precision. Based on a target population of 5,000 and a 5% margin of error, the resulting sample size was approximately 370. To accommodate possible non-response, a minimum of 350 completed surveys was targeted.

For the qualitative interviews, a sample of between 20 and 30 participants is planned. This range is considered sufficient to achieve thematic saturation, where no new insights emerge from additional interviews (Creswell, 2013). Similar sample sizes have been used in previous Zambian studies on project risk management (Phiri & Tondolo, 2020).

- *Target Population*

The target population comprised vulnerable small-scale farmers aged 30–70 in Nakonde District, including elderly individuals, farmers with chronic conditions, and pregnant women. These groups were more susceptible to climate-related food insecurity due to health limitations, economic constraints, and heightened nutritional needs (Moyo et al., 2020).

- *Data Collection Method*

Data collection will involve both primary and secondary sources. Primary data will be collected through structured questionnaires and semi-structured interviews. The questionnaires will be designed using a Likert-scale format to measure risk management practices across key dimensions such as identification, assessment, mitigation, and monitoring. They will be distributed electronically through platforms such as Google Forms to improve reach and efficiency. Semi-structured interviews will be conducted either face-to-face or virtually, depending on availability and accessibility, and provided in-depth insights into the perceptions and experiences of professionals.

Secondary data will be sourced from project evaluation reports, industry surveys, academic journals, and professional publications relating to risk management in Zambia and globally. This secondary data will provide valuable context and facilitated the triangulation of findings.

All data collection procedures will adhere to ethical standards. Participants will be provided with informed consent forms outlining the purpose of the study, confidentiality assurances, and their right to withdraw at any stage. To protect sensitive information, all responses will be anonymized (Resnik, 2018).

- *Data Analysis*

Data analysis will involve a combination of quantitative and qualitative, based approaches. Quantitative data from the surveys will be analyzed using the Statistical Package for the

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Social Sciences (SPSS). Descriptive statistics, including means, standard deviations, and frequencies, will be used to summarize the data, while inferential statistics, such as Pearson correlation, regression analysis, and analysis of variance (ANOVA), will be employed to test the hypothesized relationships between risk management practices and project success (Field, 2018).

Qualitative data from the interviews will be transcribed verbatim and analyzed using NVivo software. Thematic analysis following Braun and Clarke's (2006) six-step framework, which involves familiarization, coding, theme generation, reviewing, defining, and reporting themes. This process will facilitate the identification of recurring patterns and themes in participants' experiences of risk management.

➢ *Triangulation*

To enhance validity and reliability, triangulation will be employed at both the data and methodological levels. Data triangulation will be achieved by integrating multiple sources of evidence, including surveys, interviews, and secondary documents. Methodological triangulation will involve combining quantitative statistical analyses with qualitative thematic insights. According to Denzin (2012), triangulation reduces bias and strengthens the credibility of findings. In Zambia, where empirical data on project risk management remains limited, triangulation is particularly valuable in ensuring a more comprehensive understanding of the phenomenon (Mwansa & Mwaanga, 2019).

➢ *Limitations of the Study*

Despite the robustness of the design, certain limitations are anticipated.

- First, the reliance on self-reported data introduces the risk of social desirability and recall biases, where respondents may exaggerate or understate the effectiveness of risk management practices (Podsakoff et al., 2003).
- Second, the study is and will be limited to Zambia, and while the findings provide important contextual insights, their generalizability to other countries may be limited.
- Third, access to sensitive organizational data might pose a potential challenge, particularly in projects involving government or high-value contracts.
- Fourth, the use of online surveys could exclude professionals with limited internet access, although efforts will be made to provide alternative modes of participation.

Despite these limitations, the use of triangulated methods, robust sampling procedures, and advanced analytical techniques will enhance the validity of the study, ensuring that its findings contribute meaningfully to the body of knowledge on project risk management in Zambia and beyond.

➢ *Ethical considerations*

In every field of research ethical issues are important to be adhered to. the researcher produced a letter of introduction for permission to interview various respondents. Overall, the following ethical considerations were adhered to;

- *Ethical Clearance:*

The proposal will be subjected to ethical clearance before data collection.

- *Confidentiality of Data:*

The data obtained from the respondents will be accessible only to the researcher and her supervisor. All information will be given code numbers and no names were recorded. All data was transferred to a password protected personal computer. All published articles arising will have no information that revealed the identity of any participants.

- *Non-Maleficence to Participants:*

The research will not inflict any harm or injury to the study participants.

- *Voluntariness:*

The participation of individuals in this study is entirely voluntary. Individuals choose to participate or withdraw from the study at any point in time.

Respect for persons will be taken into account in this research. According to Rebecca *et al* (2011), this principle requires that each individual subject in the study be treated as autonomous agents.

IV. PRESENTATION AND DISCUSSION OF FINDINGS

➢ *Overview*

This chapter presents the findings of the study on examining the effectiveness of risk management processes in enhancing project completion and overall success, with a specific focus on Zamtel's 5G Digital Project within Zambia's IT sector. The chapter is organized according to the three specific objectives of the study: (1) establishing the types of risk management practices used in IT project management in Zambia, (2) evaluating the effects of risk management processes on project completion, and (3) ascertaining the relationship between effective risk management processes and project completion. Data were collected from 50 respondents comprising project managers, team members, and stakeholders involved in Zamtel's 5G rollout and related IT projects across Zambia. The presentation employs descriptive statistics including frequencies, percentages, means, and graphical representations (pie charts, bar graphs, and histograms) to illustrate key patterns. Each section integrates findings with empirical evidence from the literature review and contextualizes results within Zambia's telecommunications landscape, particularly referencing documented challenges such as the 35 failed 5G sites reported in the 2023 Auditor-General's Parastatal Report, the 2018 rollout shortfall, and systemic governance issues affecting Zamtel's digital transformation.

➢ *Background Characteristics of Respondents*

Understanding the demographic profile of respondents is critical for interpreting the findings and assessing the validity of responses. This section presents the background characteristics including roles, experience levels, project scales, regional distribution, and project involvement history.

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- *Current Role in Project Management*

The distribution of respondents by their current roles in project management is presented in Figure 1 below.

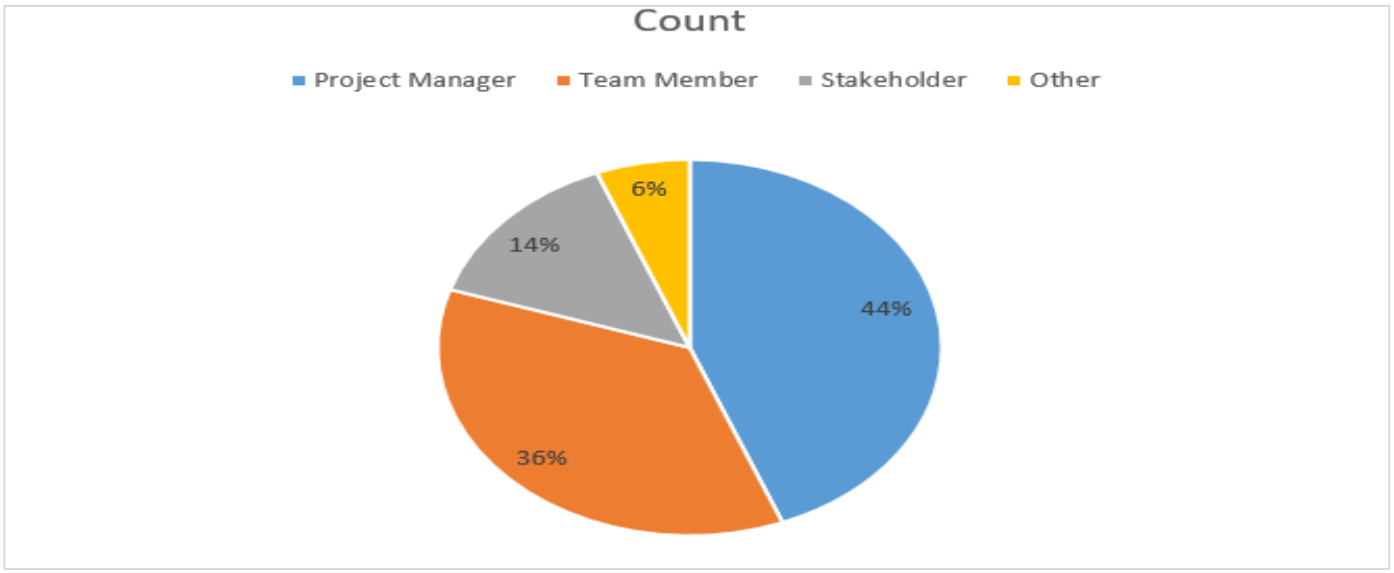

Fig 1 Distribution of Respondents by Role

The findings indicate that project managers constituted the largest proportion of respondents (44%), followed by team members (36%), stakeholders including clients and sponsors (14%), and others such as consultants and technical specialists (6%). This distribution is considered appropriate for the study as project managers possess comprehensive oversight of risk management processes, while team members provide operational insights into implementation challenges. The inclusion of stakeholders ensures that external perspectives on risk impacts are captured. The predominance of managers aligns with purposive sampling strategies employed in similar Zambian studies (Shimwambwa, 2020; Chileshe, 2019), where decision-makers' experiences are prioritized for evaluating strategic processes like risk management.

In the context of Zamtel's 5G project, the 44% manager representation reflects the organizational structure where project leadership is responsible for navigating complex technical and financial risks documented in parliamentary reviews (Parliament of Zambia, 2019). The relatively high proportion of team members (36%) is particularly relevant given that the 2023 Auditor-General's report highlighted weaknesses in technical system management, including unpatched Oracle databases, suggesting that operational staff insights are crucial for understanding risk mitigation gaps at implementation levels.

- *Years of Experience in Project Management*

Figure 2 presents the distribution of respondents according to their years of experience in project management.

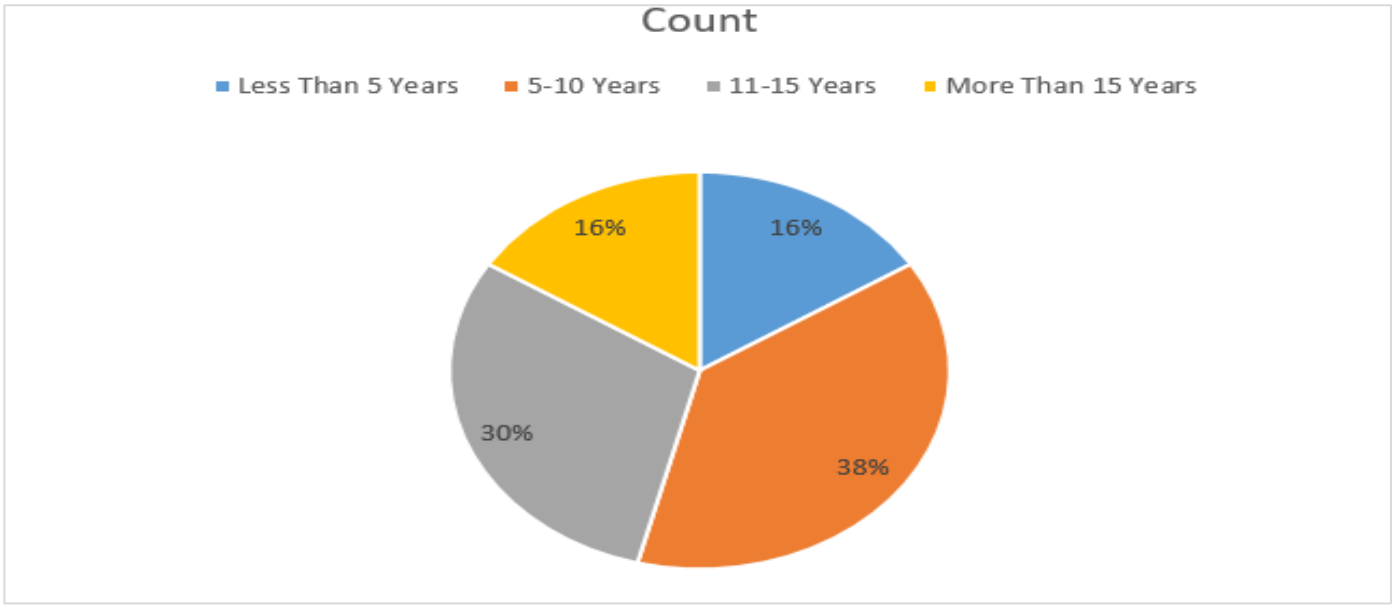

Fig 2 Years of Experience in Project Management

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The majority of respondents (38%) had between 5-10 years of experience in project management, followed by those with 11-15 years (30%). Respondents with less than 5 years and those with more than 15 years each constituted 16% of the sample. This distribution indicates a predominantly experienced sample, with 84% having at least 5 years of experience, which satisfies the inclusion criteria specified in the methodology requiring minimum five years of professional experience. The concentration in the 5-15 years range suggests respondents have witnessed multiple project cycles and are well-positioned to evaluate risk management effectiveness across different phases of Zamtel's infrastructure evolution.

The data indicate that individuals with primary education constitute the largest proportion, accounting for 21.0 percent of the sample. This suggests that a significant segment of the population has attained only basic formal education. Secondary education follows with 17.0 percent, representing a moderate level of educational advancement beyond the primary level.

- *Sector of Work*

All 50 respondents (100%) indicated they primarily work in the IT sector, which is consistent with the study's focus on Zamtel's 5G Digital Project and related telecommunications infrastructure initiatives. While the questionnaire allowed for specification of "Other" sectors, no respondents selected this option, confirming the targeted nature of the sampling strategy. This homogeneity ensures that findings are directly applicable to IT project contexts rather than diluted by cross-sectoral variations that might confound risk management patterns specific to technology deployments.

Within Zambia's IT sector, telecommunications represents a critical sub-domain characterized by capital intensity, rapid technological change, and regulatory complexity (ZICTA, 2021). The exclusive IT focus aligns with the study's objective to examine risk processes in environments where technical uncertainties (e.g., 5G spectrum allocation, network interoperability) intersect with institutional challenges (e.g., funding constraints, governance weaknesses) documented in Zamtel's audit history. This sectoral concentration allows for deeper analysis of IT-specific risks such as cybersecurity vulnerabilities exemplified by Zamtel's unpatched Oracle databases identified in the 2023 Parastatal Report compared to broader multi-sector studies that may overlook such technical nuances.

- *Typical Scale of Projects*

The distribution of respondents by typical project scale based on budget is presented in Figure 3.

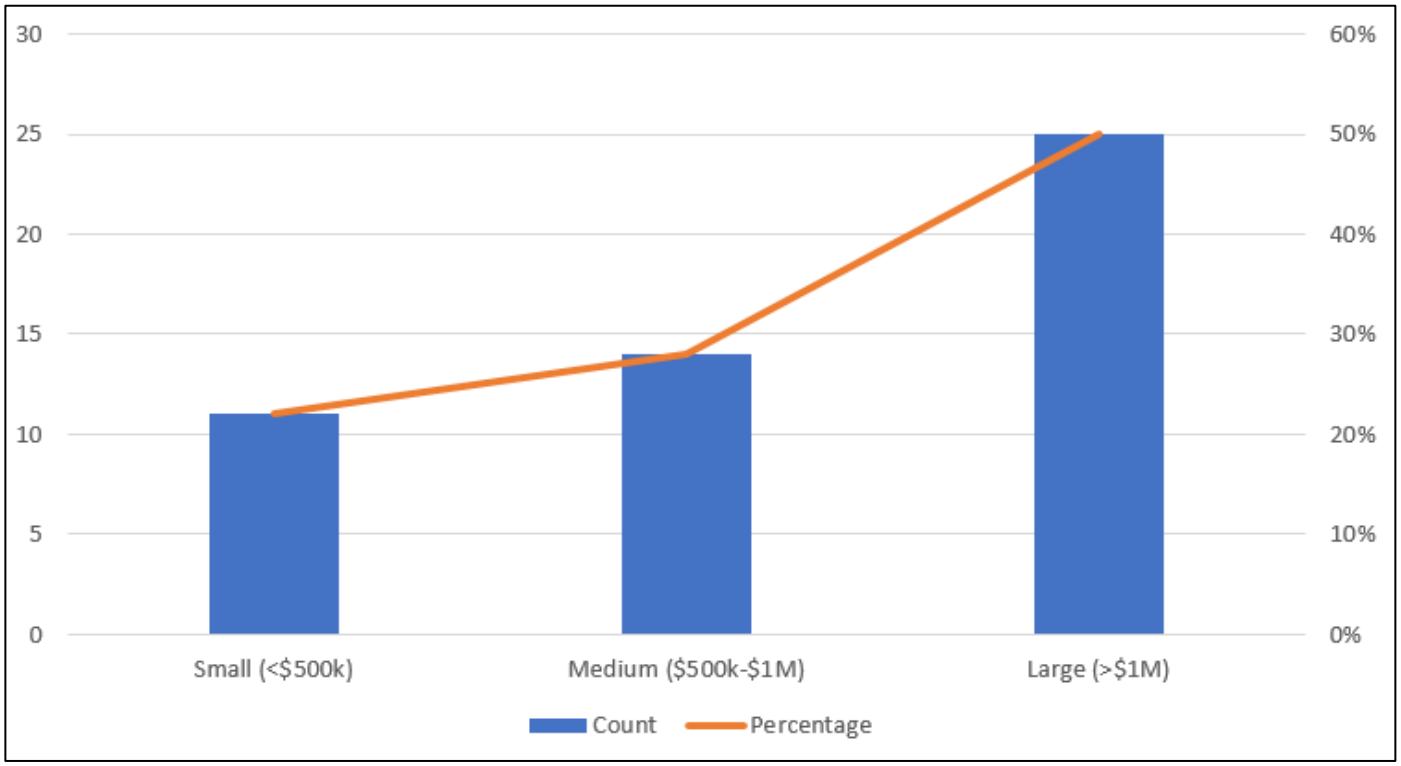

Fig 3 Typical Scale of Projects by Budget

Half of the respondents (50%) are involved in large-scale projects with budgets exceeding US$1 million, while 28% work on medium-scale projects (US$500,000-$1 million), and 22% on small-scale projects (less than US$500,000). The predominance of large-scale project experience is highly relevant to the study's focus on Zamtel's 5G rollout, which represents a multi-million dollar infrastructure investment. Specifically, Zamtel's 2025-2029 strategic plan targets deployment of up to 1,400 sites (Africa-Press, 2025), building on the 2017 US$280 million investment framework (Ecofin Agency, 2017), clearly positioning the 5G initiative within the large-scale category.

- *Regional Distribution of Projects*

Figure 4 illustrates the regional distribution of projects in which respondents are primarily involved.

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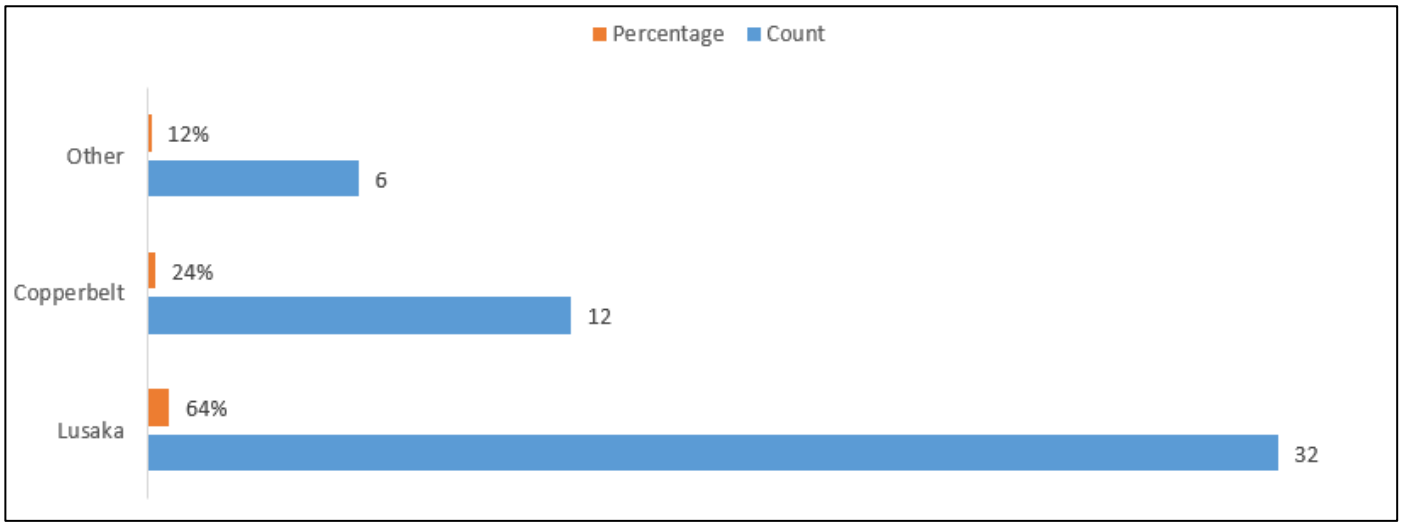

Fig 4 Regional Distribution of Projects

The majority of respondents (64%) are involved in projects primarily located in Lusaka, Zambia's capital and economic hub, followed by the Copperbelt region (24%), and other regions collectively accounting for 12%. This concentration in Lusaka is expected given that Zamtel's headquarters and major network operations centers are based there, and the first 4G/5G site launched in May 2025 was in Chalala, Lusaka (ITWeb Africa, 2025; TechAfrica News, 2025). As the seat of government and commercial activity, Lusaka hosts critical infrastructure that necessitates priority deployment of advanced telecommunications technologies, making it the logical focal point for 5G rollout phases.

The 24% Copperbelt representation reflects the region's economic significance as Zambia's mining heartland, where industrial connectivity demands drive telecommunications investment. The 2017 expansion plan targeting over 1,000 towers included rural and under-served areas (Ecofin Agency, 2017), suggesting that Copperbelt deployments form part of broader coverage objectives beyond Lusaka. The 12% "Other regions" category likely encompasses provincial capitals and strategic corridors where Zamtel is extending 4G/5G capabilities to support national digital inclusion goals articulated by the Industrial Development Corporation (IDC Zambia, 2025).

➢ *Regional Distribution of Projects*

Figure 5 illustrates the regional distribution of projects in which respondents are primarily involved.

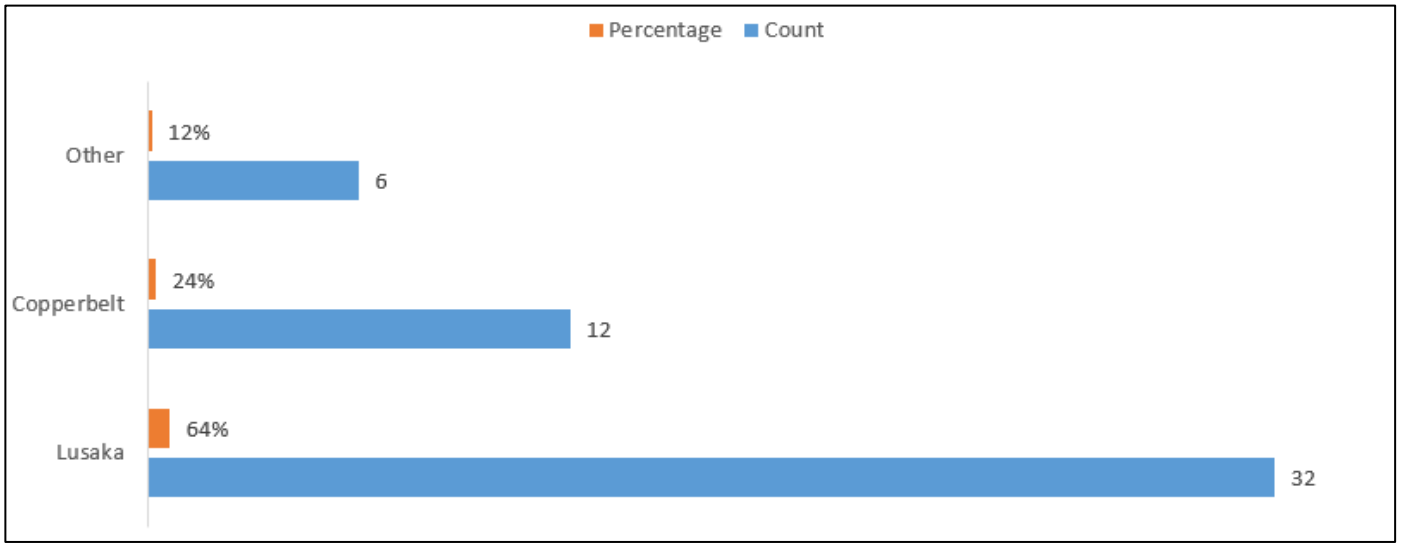

Fig 5 Regional Distribution of Projects

The majority of respondents (64%) are involved in projects primarily located in Lusaka, Zambia's capital and economic hub, followed by the Copperbelt region (24%), and other regions collectively accounting for 12%. This concentration in Lusaka is expected given that Zamtel's headquarters and major network operations centers are based there, and the first 4G/5G site launched in May 2025 was in Chalala, Lusaka (ITWeb Africa, 2025; TechAfrica News, 2025). As the seat of government and commercial activity, Lusaka hosts critical infrastructure that necessitates priority deployment of advanced telecommunications technologies, making it the logical focal point for 5G rollout phases.

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The 24% Copperbelt representation reflects the region's economic significance as Zambia's mining heartland, where industrial connectivity demands drive telecommunications investment. The 2017 expansion plan targeting over 1,000 towers included rural and under-served areas (Ecofin Agency, 2017), suggesting that Copperbelt deployments form part of broader coverage objectives beyond Lusaka. The 12% "Other regions" category likely encompasses provincial capitals and strategic corridors where Zamtel is extending 4G/5G capabilities to support national digital inclusion goals articulated by the Industrial Development Corporation (IDC Zambia, 2025).

V. CONCLUSION AND RECOMMENDATIONS

➢ *Overview*

This chapter presents discussion of the findings, draws conclusions based on the objectives of the study. The order of the research objectives was used to arrange the study's conclusions. This chapter also included recommendations resulting from the investigation conducted by the researcher

➢ *Conclusion*

This study examined the effectiveness of risk management processes in enhancing project completion and overall success in Zambia's IT sector, with a focus on ZAMTEL's 5G Digital Project. Drawing from a mixed-methods approach involving surveys (n=50) and interviews (n=25), the findings reveal moderate adoption of risk management practices, particularly qualitative methods such as brainstorming, checklists, and stakeholder engagement (means ranging from 3.4 to 4.1), while quantitative tools like Monte Carlo simulations remain underutilized (mean 2.8). This aligns with broader Zambian trends of low maturity in risk management, where only 15% of organizations achieve advanced levels, as noted in prior literature.

➢ *Recommendations*

Recommendations Based on the findings, the following recommendations are proposed to improve risk management in Zambia's IT sector, particularly for projects like ZAMTEL's 5G rollout:

- Enhance Adoption of Quantitative Tools: Organizations should invest in training programs through institutions like the Engineering Institution of Zambia (EIZ) and PMI Zambia Chapter to increase the use of advanced techniques such as Monte Carlo simulations and fuzzy models. Pilot programs at ZAMTEL could target skill shortages, aiming to raise adoption rates from 30-35% to over 50% within two years.
- Strengthen Monitoring and Feedback Mechanisms: Implement mandatory risk registers and regular audits throughout the project lifecycle, with centralized databases for lessons learned. ZAMTEL should conduct post-phase reviews to create effective feedback loops, addressing the current weak perception (mean 3.28) and reducing recurrence of issues like funding shortfalls.
- Foster Leadership and Cultural Support: Senior management at state-owned enterprises like ZAMTEL must prioritize risk management by integrating it into governance structures and performance incentives. Training executives on Prospect Theory could mitigate loss aversion biases, while promoting a risk-aware culture through workshops to leverage the high perceived importance of leadership (72% agreement).
- Adapt Frameworks to Local Contexts: Develop hybrid risk models incorporating PMBOK with Zambian-specific contingencies for economic and political risks. Government policies should mandate integrated risk management in PPPs, drawing from ISO 31000, to address external moderators like regulatory inconsistencies and supply chain vulnerabilities.
- Promote Stakeholder Engagement and Resource Allocation: Increase involvement of stakeholders in risk identification to handle external threats, and allocate dedicated budgets for risk activities (building on the 45.5% in financial sectors). For ZAMTEL, public-private partnerships could secure funding, reducing abandonment risks.
- Future Research Directions: Conduct longitudinal studies on post-2025 ZAMTEL phases to assess long-term impacts, and comparative analyses across African countries to generalize findings. Explore AI-driven risk tools for real-time monitoring in volatile environments.

Implementing these recommendations could significantly enhance project completion rates, fostering sustainable digital transformation in Zambia.

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