RISK MANAGEMENT STRATEGIES IN LAND SURVEYING: A CASE STUDY OF PIONEER ENGINEERING AND CONSTRUCTION COMPANY

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A RESEARCH PROJECT SUBMITTED TO THE SCHOOL OF MANAGEMENT AND LEADERSHIP IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF BACHELOR OF ARTS IN DEVELOPMENT STUDIES OF THE MANAGEMENT UNIVERSITY OF AFRICA

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DECLARATION

This project is my original work and has not been presented for a degree at any other university.

Signature..... **Date**.....

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ODLBDS/29/00427/1/23

This project has been submitted for examination with my approval as University Supervisor.

Signature…… **Date ……...**

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DEDICATION

To my family, especially my mother, for all the sacrifices and prayers throughout the journey. To my friends Clement, Gregory, John, Florence, Kelly, Sarah, Jack, and Douglas, who advised, encouraged, and made the journey easier.

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I give God all the glory He has graced and provided me throughout this journey.

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ABSTRACT

Construction and engineering projects are inherently more complex and prone to risks, adversely affecting schedule, cost, and quality. Land surveying is particularly susceptible to all the technical, legal, environmental, and operational uncertainties (because before the actual construction can occur, it is an inevitable step that must be taken). The reality is more exacerbated in Kenya, where the streets are becoming fast urbanized; the infrastructure development and the country's ambitions to realize its Vision 2030 development agenda make it even more critical to have correct and timely land data. This study aimed to assess the practice and effectiveness of the project risk management activities within the land surveying role at the Pioneer Engineering and Construction Company Ltd. It focused primarily on risk acceptance, risk avoidance, risk mitigation, and risk transfer as being among the core risk strategies, and discussed the impact they had on the performance of the projects. A descriptive research design was adopted, whereas a structured questionnaire was employed to collect quantitatively oriented data on 70 research respondents, surveyors, technical staff, and project managers who directly engaged in land surveying. The sampling method was purposive, and only people with practical knowledge of surveying operations were used. Descriptive statistics (frequencies, percentages, and mean) were used to analyze data; findings were tabulated. The research aimed to find ways of reviewing the frequency and proficiency of the risk strategies adopted and the effects of these practices on the results of the projects regarding meeting timeliness, validity of data, and customer satisfaction. The findings indicated that reduced risk and avoidance of risks were the most sought and practiced measures. The respondents expressed that modern technologies, such as drones, RTK GPS, and GIS, were distributed widely, providing more correct and non-delaying data regarding operations. Preemptive risk avoidance measures were also standard, i.e., making pre-siting explorations and avoiding contentious zones. These approaches resemble the books on learning to appreciate technological integration and risk identification in the initial stages. A discriminative application of risk acceptance occurred where mitigation costs exceeded anticipated risks. However, it possessed internal control mechanisms to verify those risks. Insurance and contract provisions of risk transference were identified but were not as consistently practiced, so implementing policies should be facilitated. The research concluded that good risk management practices positively influenced project performance, resulting in improved delivery deadlines, data quality, and stakeholder satisfaction. Findings align with the project management and systems theory, which suggests a proactive and coordinated attitude towards uncertainty. However, though the study is limited to a single organization, it is educational to the actual industry participant and the policy-makers seeking to enhance risk preparedness in the land surveying industry. The study suggests formalizing an official risk management system, making risk reporting mandatory in all project reports, frequent risk training to understand deep-rooted risk measurement tools, and last but not least, research into external factors of risk of land surveying in Kenya. The suggestions would allow companies to increase operational and long-term resilience to manage a more complex construction environment.

Table of Contents

LIST OF TABLES

LIST OF FIGURES

ACRONYMS AND ABBREVIATIONS

MUA	Management University of Africa
GIS	Geographic Information System
GPS	Global Positioning System
ISK	Institution of Surveyors of Kenya
PMI	Project Management Institute
PMO	Project Management Office
RTK	Real Time Kinematic (a high-precision GPS correction technology)
SOPs	Standard Operating Procedures
SPSS	Statistical Package for the Social Sciences
CPD	Continuing Professional Development

OPERATIONAL DEFINITION OF TERMS

Risk: An uncertain event or condition that, if it occurs, affects the outcome of a project (PMI., 2017).

Risk Management: A systematic process of identifying, analyzing, and responding to project risks.

Risk Acceptance: A strategy where the project team acknowledges a risk but chooses not to act on it.

Risk Avoidance: A strategy to eliminate the risk by changing project plans or approaches.

Risk Mitigation: A strategy that reduces the likelihood or impact of a risk through proactive measures.

Risk Transfer: A strategy that shifts responsibility for a risk to another party, often via insurance or contracts.

Land Surveying The science and art of determining the relative positions of points on or near the Earth's surface for purposes such as boundary setting, mapping, and planning (Henderson, 2020).

RTK/GPS A satellite navigation technique used to enhance the precision of position data derived from satellite-based positioning systems. This technology is referenced in the study as one of the tools used to reduce survey risk.

SPSS: A software package used for logical batched and non-batched statistical analysis. This research uses SPSS to analyze the quantitative data collected from survey respondents.

CHAPTER ONE

INTRODUCTION

1.1 Background

Today, projects are being used increasingly in very uncertain and dynamic environments, which are said to be complex, volatile, and uncertain. Regardless of their size or sector, projects are temporary undertakings with unique goals and constraints, often exposed to "unforeseen events that can derail timelines, inflate costs, and compromise objectives." The following is a definition of a project risk given by the Project Management Institute. In addition to these challenges, project risk management's role in anticipating, evaluating, and responding to risks and opportunities throughout the project lifecycle has become a much-needed profession. (PMI., 2017) Project managers can improve their decisions by calculating the risks and opportunities in the initial phases of project performance, also, by influencing the outcomes and resources (Kerzner, 2018). The developed economies have proceduralized the entire project risk management systems, with the underpinning of high technology systems and regulatory environment to facilitate the delivery of projects on time, under budget, and within scope.

Project risk management is quickly becoming serious in Africa, especially in sub-Saharan Africa. Nevertheless, lack of proper planning, ineffective leadership, and technical inadequacy are some of the severe complexities with infrastructure in most countries (Munyoki, 2018). The consequences of these weaknesses are usually delays in the execution of the project, running over the budget, and cutting down on quality. One of the key triggers of these failures is the existence of strong risk management schemes, and the necessity to implement the regional solutions in the context of the African project environment is to be considered.

The development of Kenya's infrastructure is essential to the country's progress, especially as stated in Vision 2030, which aims to make the country a middle-income country by making significant investments in housing, electricity, water, and transportation infrastructure. A much less frequently mentioned part of these operations is land surveying. Land surveying provides the space data required during the designing, planning, and execution of a project. The borders of individual properties, topography, and other site characteristics must be correctly surveyed and determined. Surveyors are required for site selection, construction alignment, project feasibility analysis, and claims. (Henderson, 2020)

However, the land surveying sector in Kenya faces a wide range of risks. Legal ambiguities, ambiguous property ownership, environmental disturbances, technological difficulties, and sociopolitical meddling are a few examples. These hazards frequently lead to disagreements about boundaries, hold-ups, errors, and exorbitant project expenses. Unresolved surveying concerns can sometimes lead to the abandonment of entire projects. (Johnson, 2021) Although technology instruments like drones, Global Positioning Systems (GPS), and Geographic Information Systems (GIS) have improved surveying accuracy, they have also raised new concerns that call for specific training, frequent calibration, and data protection procedures.

The required information is land survey information. This information should be timely and accurate in large building projects like those of Pioneer Engineering and Building Company Ltd. Surveying errors may be caused by human, technological, or legal factors and may impact entire projects. This study assesses how this organization's land surveying activities use the four main project risk management strategies: risk acceptance, avoidance, reduction, and transfer.

The act of acknowledging a danger but choosing not to take any action, frequently because the expense of risk mitigation outweighs the risk's impact, is known as risk acceptance. On the other hand, risk avoidance entails changing the project's technique or scope to eliminate the risk. By investing in better equipment or enhancing stakeholder collaboration, risk reduction involves taking proactive measures to lessen a risk's likelihood or impact. Finally, risk transfers are a reaction toward a third party in the form of an insurance contract or policy. (Hillson, 2020)

The proposed study will add to the academic literature and advance the projects' practical performance by critically examining the application of such an approach in land surveying activities. Successful land surveying projects depend on efficient risk management, which is crucial for achieving Kenya's larger infrastructure objectives and guaranteeing sustainable national growth.

1.1.1 Pioneer Engineering Construction profile

Pioneer Engineering and Construction Company is listed and licensed as a general contractor in Nairobi, Kenya, and Somalia. The company offers a one-stop construction service that includes general contracting, project planning and design, and material and tool supply.

Pioneer's organizational model integrates a multidisciplinary team of engineers, architects, and quantity surveyors to enable thorough planning, risk assessment, and mitigation from the

beginning of each project. The company's approach to project delivery demonstrates knowledge of risk management and customer protection, providing adaptable models like:

Fixed-price tenders assist clients in reducing their financial risk. The route of shared vulnerability strategy Pioneer guides the customers in this strategy, which helps them proactively move toward exposing project risks, such as delays and cost escalations—a minimal accountability system with less of a legal and coordination problem, a single-contract system. Constructability reviews, value engineering, and cost estimating are some of the initial planning, and all the risk management tools are necessary.

The company's work with well-known clients, including the Government of Kenya, GIZ, the Red Cross, and UN organizations, indicates a solid ability to meet quality assurance, compliance, and health and safety requirements.

With its organized procedures and flexible delivery models, Pioneer Engineering and Construction exemplifies a strategic approach to risk assessment, mitigation, and project sustainability in East Africa's construction industry (Pioneer Construction, n.d.).

1.2 Problem Statement

Several threats are prevalent, which may impair the success of any building project, particularly land surveying. The hazards associated with them include data inaccuracy, equipment failure, environmental issues, disagreement on legal boundaries, and safety issues. (Oludare, 2020) The engineering force. To control these risks of land surveying, construction companies like Pioneer Engineering and Construction Company Ltd. play a key role in the accuracy of site data, practicality of the projects, and legal compliance. (Akintoye, 1997)

Weak risk mapping and management have remained the operational and legal limitations to most Kenyan companies, even with formal risk management approaches such as risk avoidance, risk-reducing, risk transference, and risk contingency. (Wachira, 2018) A shortage of robust frameworks to evaluate and address these risks is usually coupled with project delays, rework, and costly disputes. (Hwang, 2014)

This study evaluates Pioneer Engineering and Construction Company Ltd.'s present risk management techniques used in land surveying and suggests enhancements. The results help develop even more reliable geospatial project planning tools and improve the understanding of risk management habits adopted by Kenyan land surveyors.

1.3 Objectives of the study

1.3.1 General Objectives

To evaluate and find various risk management options used in land surveying ventures: A Pioneer Engineering and Construction Company Ltd case study.

1.3.2 Specific Objectives:

a) This is to assess Pioneer Engineering and Construction Company Ltd's application of risk acceptance in a land survey project.
b) To look into using risk aversion methods in land survey activities at the company.
c) To establish the existence of mitigation measures to undertake the land surveying process.
d) To address the transfer of risk effect on how risk management applies to land surveying works in the company.

1.3.3 Research Questions

In the study, the researchers will seek to answer the following four research questions:

i. What is risk acceptance practice in the land surveying works of Pioneer Engineering and Construction Company Ltd.?
ii. What risk avoidance strategies are practiced and related to the company's land surveying operations?
iii. Do you know the strength of risk mitigation practices in land surveying practices?
iv. What is the role of risk transfer in managing land surveying projects at Pioneer Engineering and Construction Company Ltd.?

1.4 Relevance of the Study

Surveying land is an inseparable process of development projects involved in construction and engineering, where required design planning and development information are provided. However, the process is technically complex, and errors could be made because of environmental factors, technical inaccuracy, and human error (Akintoye, 1997). This leads to budgetary overruns, project completion slippages, and lawsuits. Since construction projects have become increasingly complicated and effective, risk management techniques have become more significant. (Wachira, 2018)

Such a study is significant because it tries to assess the state of affairs concerning the risk management processes within the land surveying industry, both to learn what the challenges

that surveyors are currently encountering are and to know how the technological advances in the form of the GPS and drones could be utilized both to address the menace effectively. The study will produce helpful suggestions for enhancing risk management strategies in Kenya's building sector. The above recommendations are likely to reduce risk-taking, increase the success of projects, and encourage wiser choices regarding the direction and flow of building projects.

1.5 Scope

This study solely examines Pioneer Engineering and Construction Company Ltd.'s risk management techniques in land surveying. It explores the four main strategies (risk transfer, risk mitigation, risk avoidance, and risk acceptance). This area of research focuses on surveyors, project managers, and other associated players who are directly involved in land surveying activities.

The study will consider projects completed during the last five years (2020–2024) to provide a current and pertinent analysis of the risk environment and strategic practices. This will not apply to such building departments or independent enterprises. Though this domain is regarded as necessary, the report considers the use of new technologies like drones, GPS, and field surveying among Pioneer Engineering and Construction Company employees.

1.6 Chapter Overview

The study's background, problem statement, objectives, research questions, validity, and scope have all been presented in this chapter. It highlights the construction process's risks and the usefulness of land surveying. The four main risk management techniques that comprise the conceptual focus of the study (risk acceptance, avoidance, mitigation, and transfer) are also covered in the chapter. The chapter sets the stage for a thorough evaluation of Pioneer Engineering and Construction Company Ltd.'s application of these tactics and how they may be enhanced to guarantee better project outcomes in Kenya's construction industry.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

The chapter at hand provides an overview of the available literature on risk management strategies in land surveying, particularly risk acceptance, risk avoidance, risk mitigation, and risk transfer. It is followed by an empirical review of the existing literature and a theoretical literature review. The chapter consists of a conceptual framework, operationalization of variables, research gap, and summary.

2.1 Literature Review

Risk management directly depends on land surveying, especially in construction companies like Pioneer Engineering and Construction Company. Topography, equipment reliability and human error, risk identification, assessment, and mitigation will systematically involve the processes depending on their unpredictability and regulatory frameworks. This section examines the central ideas and theories that underpin the design of risk management plans as far as land surveying activities are concerned.

2.1.1 Risk Management Theory

The risk management theory provides a methodical approach to risk identification, mitigation, and assessment of project risks. The four dominant response strategies firms should undertake are avoidance, mitigation, transfer, and retain. (Hopkin, 2018) These approaches assist the project groups in decision-making regarding accepting, reducing, transferring to a party, and deleting risk. The theory instructs organizations engaging in land surveying to respond to project risks by retorting, accepting, eliminating, or externalizing the risks.

One can be found in avoidance, which may involve not surveying a high-risk area, such as areas full of political unrest or environmental risks. (PMI, 2021) Mitigation Prevention via the mitigation using high-level geospatial instruments and technologies, e.g., RTK GPS and GIS, regular equipment recalibration, and staff training. (Naniopoulos, 2021) Risk transfer entails casting all risk responsibility to third parties through insurance or sub-contracting; risk acceptance (retention) involves tolerating low-impact risks when mitigation is infeasible or cost-effective. (PMI, 2021) This theory allows project managers in organizations like Pioneer Engineering to align the severity of the risks with the response measures to minimize disruptions and front risks.

2.1.2 Contingency Theory

Currently the contingency theory was first introduced by Fiedler. It relies on the fact that the quality of healthy decision-making is influenced by both internal and external environmental factors (Fiedler, 1964). It infers that risk solutions should be prepared on an occasion-to-case basis rather than being an ideal solution to risk management. Land surveying that involves risk transfer and avoidance works well with this idea.

Take Pioneer Engineering as an example; risk avoidance techniques can be used at high-probability sites or rural areas where vulnerabilities are high, and mitigation factors regarding uncertainties are low. However, an even more radical solution, automation or specialization of employees, may be allowed in urban surveying undertakings, where the infrastructure is more convenient to reach and the regulations less obscure. (Makokha, 2017)

The implementation of risk transfer in the project is also supported by contingency theory, which states that the company has no internal resources. To illustrate, when faced with a lack of in-house resources, Pioneer has the option to consult legal aid in land titling or maps drawn using drones. This way, the company can provide project requirements without going beyond. (Agyekum, 2014)

Lastly, risk retention is circumstantial. In a project of minimal value or with rote operations, pioneers may decide to maintain small risks rather than pay a mitigation or transfer payment. Another good option is risk retention where the estimated effect is within the range of reasonableness and where the company uses internal controls to ensure the contained effect, as discussed. (Hopkin, 2018)

Contingency theory shows that Pioneer Engineering's risk solutions must be tailored to each project's unique requirements. The strategy (avoidance, mitigation, transfer, retention) should be based on a comprehensive internal resource assessment, an external event assessment, and an estimated impact on the project goals.

2.1.3 Systems Theory

Systems theory was first coined by Von Bertalanffy and views undertakings as complex, interconnected, structured systems where the collapse of any single component may fail the whole system. (Von Bertalanffy, 1968) This construct emphasizes how one should ensure that everything, including people, technology, procedures, and environment, must match so that risks can be avoided and/or reduced in managing project risks. Circumstances.

In addition to risk management in land surveying, Systems Theory notably provides a perfect background. Inaccurate data, for example, might lead to cost overruns and legal issues if surveying equipment (such as RTK GPS) malfunctions due to neglect. Systems Theory recommends using integrated training programs, quality assurance procedures, and Standard Operating Procedures (SOPs) to prevent these cascade failures (Makokha, 2017).

This, too, is a risk encouraged through the theory of risk transfer, especially within the environmental risk analysis and compliance with the law in cases where the company has systemic weaknesses. Risk externalization mechanisms, e.g., by subcontracting or with insurance cover, can help facilitate systemic integrity's safety. Additionally, accepting the risk can be well explained when a risk is too small to significantly impact the entire system as long as monitoring procedures are implemented.

2.2 Empirical Literature Review

2.2.1 Strategies to Avoid Land Surveying Risks

Risk avoidance is an active mode of managing risks by removing the situation or the action that can be risky. In land surveying, risk avoidance can include not being in places where violence can occur, not getting involved in complicated locations, or having fieldwork scheduled during the best weather. To promote impediments and safety, it was observed that surveyors in their survey of fourteen schemes in their case study of the Ngoliba Settlement Scheme in Kenya shunned risky as well as flooding grounds. They used the methodology of field observations and properly constructed interviews to determine a conscious risk avoidance of risky encounters among surveyors in deciding on land.

A risk-based analysis of land surveying was conducted in the four counties in Kenya (Wafula, 2020). Using a combination of techniques, they discovered that some businesses deliberately avoided sites with a previous land tussle and weak soils. Such a strategy was crucial in reducing accidents and discord that habitually killed or paralyzed surveys. Vieira and Andrade studied civil engineering projects around the world, in Portugal, and their findings determined that precocious geotechnical reconnaissance studies and preliminary exploration played a significant role in decreasing risk (Bragança, 2015). They demonstrated through their findings that it was critical in influencing safer project outcomes at an early decision-making stage.

Although these discoveries have been made, the literature also has many gaps. The quantitative evidence does not sufficiently demonstrate the causal relationship between project success measures, e.g., reduced rework, fewer legal problems, or more cost efficiencies, and risk

avoidance. Despite this, there has been inadequate research on how risk avoidance technologies like GIS tools and predictive analytics should be employed in Kenya in making risk avoidance decisions, even though there is an attempt to develop such technologies.

2.2.2 Land Surveying Precautionary Risk Measures

Actions that reduce the probability and/or impact of potential risks are risk mitigation. Technical training, application of contemporary surveying instruments, adherence to safety regulations, and regular equipment maintenance are usually part of mitigation in land surveying. Using cutting-edge technology like drone mapping, Real-Time Kinematic (RTK) GPS and Geographic Information Systems (GIS) significantly minimized technical and safety hazards, according to a qualitative study of twelve surveying firms in Europe (Naniopoulos, 2021). These tools increased project efficiency by improving data accuracy and accelerating delivery schedules.

Makokha and Musembi emphasized the importance of human capacity in risk mitigation. (Makokha, 2017) They concluded that government radio and GPS operators' training significantly minimized errors and incongruous data when adjudicating land. Quantitative research conducted on construction survey firms in Nairobi revealed that 65 percent of the firms observed had documented mitigation plans that had been put in place. (Muthama, 2019) Such plans were followed by steps to minimize human error and eliminate equipment failure, particularly when the surveying mission entailed essential stakes.

There are several gaps in the literature. There is a lack of longitudinal studies on how long-term mitigating measures can affect project quality and sustainability. Although mitigation strategies are widely designed for large corporations, the literature's underrepresentation of mid-sized companies, such as Pioneer Engineering, limits the scope of their results.

2.2.3 Transfer of Land Surveying Risk Strategies

The redistribution of a risk burden to an external party is termed a risk transfer, usually in the form of subcontracting, insurance, or legal contracts. When the risk exceeds a company's technical capacity or is beyond its control, this strategy can help. According to Muthoni and Gathogo's interview-based study on surveying firms in Kenya, just 40% of small and mid-sized businesses have professional indemnity insurance (Muthoni, 2021). Most of the research participants had no idea how insurance could protect them in case of monetary and legal liability arising from negligence, mistakes, or conflicts during surveys.

(Agyekum, 2014) Analyzed risk transfer in Ghanaian construction companies is one of the related articles. After a survey of 75 businesses, it was found that the act of subcontracting is a standard measure that is undertaken to reduce operational and financial risks. Outsourcing of expertise, such as drone mapping and environmental impact assessment, firms will be able to reduce internal exposure and simultaneously maximize project efficiency. According to Musau's In the Legal Examination of Land Development Contracts in Kenya, risk transfer clauses were frequently absent or inadequate, making surveying businesses susceptible to legal action. (Musau, 2020)

These experiments reveal a considerable disparity between risk transfer and measurable end-of-project outcomes, e.g., legal risk alleviation and financial steadiness. Besides, very little information is available on the type of subcontracting or insurance arrangements made by Pioneer Engineering and other medium-sized companies of the same caliber. This limits our understanding of Kenya translation devices.

2.2.4 Risk Retention (Acceptance) Strategies in Land Surveying

Risk-retention is the decision to knowingly take certain risks when the cost to avoid, reduce, or transfer risks to other parties is too high. In concrete words, it means taking a predetermined minor delay due to changes in weather during land surveying or accepting measurement errors within the allowable range. Observed by Kinyanjui and Njoroge during the interview with Kenya construction SMEs, it was noted that various firms have chosen to keep minor risks, especially given the unconfirmed boundaries of the territories and unregistered records of ownership. (Kinyanjui, 2018) These remaining risks were usually handled informally and lacked formulated plans of action and structured documentation.

(Ssegawa, 2007) Read the case study and learn more about risk retention in the Ugandan context of public infrastructural work. After conducting a ground study, it was discovered that by the efficiency of the system and the scantiness of risk-sharing mechanisms like insurance, it became clear that government-owned entities were generally keeping their risks. Their statistics indicated that the informal monitoring schemes overrode the formal risk-retention procedures. It is so since the retained hazards, as Project Management Institute refers to them, are part and parcel of the construction industry but are largely unrecorded, particularly within the small to mid-businesses. (PMI, 2021)

The key limitation of the available literature up to date is the absence of clear-cut instructions that are to be observed when making risk retention decisions. There is also a small body of

evidence favoring the claim that retained risks influence the project's quality, schedule, or cost overruns. The understanding and managing of the retained risks of a firm like Pioneer Engineering ought to be further probed to put them in the required check through known upholds of business ventures.

2.3 Summary and Knowledge Gaps

Table 1 Reviewed Literature and Research Gaps

Author(s)	Year	Focus	Key Findings	Research Gap	Current Study Focus
Makokha & Musembi	2017	Risk avoidance in adjudication	Avoidance improved safety and efficiency	Limited impact data on medium-sized firms	Examine how avoidance affects safety and cost at Pioneer
Wafula et al.	(2020).	Environmental risks in surveying	Avoiding unstable soils reduced delays	Lack of quantitative impact analysis	Link avoidance to project delays and cost reduction
Naniopoulos et al.	2021	Tech-based risk mitigation	GIS and drones improved safety and accuracy	Limited Kenyan context	Assess the effectiveness of mitigation tools at Pioneer
Muthama & Omoke	2019	Formal mitigation protocols	The majority had SOPs for human error and equipment failure	Few long-term outcome studies	Analyze long-term mitigation impact on project outcomes
Muthoni & Gathogo	2021	Insurance uptake among firms	40% had indemnity insurance	Unclear impact on performance	Evaluate how risk transfer affects delivery at Pioneer
Musau	2020	Legal risk in land development	Contracts lacked risk clauses	Limited mid-sized firm data	Investigate contract-based risk transfer at Pioneer
Kinyanjui & Njoroge	2018	Risk-retention among SMEs	Firms informally	No structured evaluation of the	Document retained risks and

Author(s)	Year	Focus	Key Findings	Research Gap	Current Study Focus
			accept low-impact risks	retained risk impact	their implications at Pioneer

2.4 Conceptual Framework

The study's theoretical framework is based on the Risk Management Theory, which identifies four primaries. (Hopkin, 2018) The solutions you execute regarding project risks are risk avoidance, risk mitigation, risk transfer, and risk acceptance. These strategies form the study's independent variables and are hypothesized to influence project performance in land surveying, which is the dependent variable.

The contingency Theory itself, as well as the way it relates to the variables, is considered. (Fiedler, 1964) and the system Theory (Von Bertalanffy, 1968) in which the appropriateness and effectiveness of a risk strategy are relative to circumstance and how related the nature of the project systems is. The framework assumes that good execution of such a strategy will improve the performance outcomes, including cost control, timely outcome, data accuracy, and customer satisfaction.

Independent Variables

a) Risk Avoidance Strategies are characterized by the use of preventative strategic positioning, whereby the risk is eradicated. Surveying land may involve avoiding conflict-prone environmental unfriendliness or war.
b) Risk Mitigation Strategies: - Examples of these strategies include employee training, adherence to safety protocols, and using advanced technologies (e.g., drones, RTK GPS).
c) Risk Transfer Strategies: This is where they offload the risk to a third party, e.g., through insurance or subcontract.

Risk Retention Strategies: The following is the act of accepting risk at the will of a firm with wellness to absorb, especially those risks that are meaningless or so costly that it is impossible to eliminate, correct, or rush them along.

Dependent Variable

Land Surveying Project Performance

This covers survey results' timeliness, quality, cost control, and legal soundness. This must culminate in improved performance when sound risk management practices have been effectively utilized in the appropriate situation.

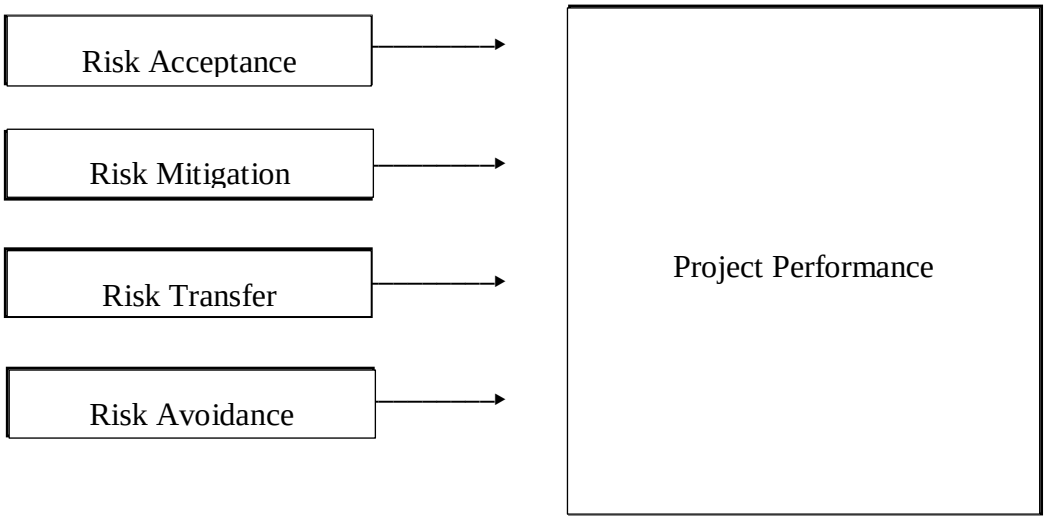

Figure 1 Conceptual Framework

2.5 Operationalization of the variables

Table 2 Operationalization of Variables

Variable	Indicators	Measurement Scale	Tools of Analysis
Risk Avoidance	- Number of risk assessment procedures - Frequency of site avoidance - Rescheduling due to anticipated risks	Ordinal (Likert Scale: 1–5)	Descriptive statistics, correlation analysis
Risk Mitigation	- Use of advanced tools (e.g., drones, RTK GPS) - Staff training frequency	Ordinal (Likert Scale: 1–5)	Regression analysis, cross-tabulation

	- Existence of SOPs and safety protocols		
Risk Transfer	- Insurance coverage presence -Subcontracting frequency - Use of legal contracts with liability clauses	Ordinal (Likert Scale: 1–5)	Correlation and regression analysis
Risk Retention	-Documented internal risk policies - Budget provisions for retained risks -Instances of accepted minor risks	Ordinal (Likert Scale: 1–5)	Descriptive statistics mean comparison
Project Performance (Dependent Variable)	- Timely project delivery - Cost control - Survey accuracy - Client satisfaction	Ordinal (Likert Scale: 1–5)	ANOVA, regression analysis

2.6 Summary of Chapter

This chapter has assessed the theoretical and practical history of risk management theories in land surveying, emphasizing risk acceptance, avoidance, mitigation, and transfer. It discusses how risk management, contingency, and systems theories can be applied to acquire appropriate risk responses. Empirical studies provided a background for using the strategies at the international and local levels. In the interim, research gaps indicate the need for context-contingent research, especially in mid-sized firms like Pioneer Engineering. A summary conceptual framework and operational definitions of the chapter were surmised to simplify data collection and analysis for subsequent chapters.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.0 Introduction

This chapter presents the research design, target population, sampling techniques, data collection instruments, procedures of pilot testing, validity and reliability, data collection procedures, data analysis procedures, and ethical considerations.

3.1 Methodology Research design

According to Pioneer Engineering and Construction Company's human resource data (as of 2024) (Pioneer Construction, n.d.), the population comprises roughly 85 employees from various departments managing survey-related operations. This enables the researcher to methodically gather and examine information regarding applying risk management techniques in Pioneer Engineering's land surveying operations. The methodology justifies its use since it will enable the researcher to evaluate the practices, opinions, and processes on an as-is basis, particularly in professional practice environments. (Mugenda, 2003)

3.2 Target Population

Based on the Pioneer Engineering and Construction Company's human resource data (as of 2024), the population comprises approximately 85 staff members across departments handling survey-related operations (pioneerconstruction, n.d.). These are the people whose work directly concerns surveying related activities and are well placed to offer pertinent information on the risk management strategies implemented.

The choice of this population is justified because these individuals have firsthand experience with the risks encountered and the strategies applied during land surveying, making their input critical to the study's objectives.

Table 3 Distribution of Target Population

Category	**Frequency**	**Percentage (%)**
Licensed Surveyors	30	35.3%
Project Managers	25	29.4%
Technical Assistants	30	35.3%
Total	**85**	**100%**

3.3 Sample and Sampling Technique

To determine an appropriate sample size from the target population of 85 staff members, Yamane's (1967) formula was used as follows:

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

Where:

n = target sample size

N = target population (85)

e = margin of error (assumed at 0.05 for 95% confidence level)

$n = 85 / (1 + 85(0.05^2)) = 85 / (1 + 85(0.0025)) = 85 / (1.2125) \approx 70$

Thus, the research sample of 70 respondents was found to be adequate.

Participants were intended to be chosen via purposeful sampling of specific departments and employment types after the sample size was determined; this exercise involved risk officers, project managers, licensed surveyors, and GIS technicians. Purposive sampling or judgmental sampling is a non-probability sampling method that consists of the use of participants with specialized knowledge, relevance, and direct participation in the topic of the study being conducted. (Creswell J. W., 2014) This approach has been selected as it will guarantee the inclusion of the responders with excellent knowledge about land surveying and risk management and relevant practical experience in these fields, which will enhance the quality and depth of the collected data.

3.4 Instrument of Data Collection

Structured questionnaires will be the main data collection tool used in the study. They are the choice tool for descriptive studies because they can capture standardized data on a significant number of individuals to facilitate statistical analysis and comparison (Bryman, 2016). The questionnaire will be composed of closed and Likert-scale questions that will gather quantifiable data on the application and perceived effectiveness of every research goal: risk acceptance, risk avoidance, risk mitigation, risk transfer, and project performance.

3.5 Pilot Study

A pilot study will evaluate the questionnaire's validity, reliability, and clarity. It will entail 10 respondents from the same construction and surveying companies in Nairobi who are not members of the principal study.

3.5.1 Validity Test

Validity is the extent to which the instrument measures what it intends to measure. (Mugenda, 2003) Risk management experts and academic supervisors will be engaged to ensure that the questionnaire aligns with the study's objectives. Their suggestions will be used to enhance the accuracy and applicability of the instrument.

3.5.2 Reliability Test

Reliability measures the time stability of an instrument. The Cronbach's Alpha coefficient will be employed to evaluate the questionnaire's internal consistency. Creswell (2014) recommends a reliability coefficient (α) of 0.7 or above, which will be deemed satisfactory. (Creswell J. W., 2014) Using SPSS analysis of pilot study answers, the reliability score will be calculated, and any needed changes will be made to it.

3.6 Procedure of Data Collection

Participants will conduct their surveys after seeking the organization's and relevant institutional authorities' permission or approval. The management of Pioneer Engineering will provide permission, and participants will be contacted to discuss the study's goal and provide their informed consent.

After ample time (about a week) to complete the questionnaires, participants will receive follow-up reminders to boost response rates. Every response provided will be documented and stored in secured storage for analysis.

3.7 Analysis and Presentation of Data

The Statistical Package for Social Sciences (SPSS), a popular instrument in quantitative research for organizing, analyzing, and interpreting data, will be utilized for data analysis (Pallant, 2020). Frequencies, means, and percentages shall be used to analyze the data gathered, the first level of analysis being descriptive statistical analysis to synthesize the respondent characteristics and identify the broad trends. (Kothari, 2004) The influence of the basic risk management methods of risk acceptance, avoidance, mitigation, and transfer to project performance will be measured through correlation analysis. Regression analysis will also be performed to assess the predictive effect of each method on key project logistics, including timeliness, cost control, and inform action integrity. (Creswell J. W., 2018) Together with interpretive narratives that bolster the study's objectives, tables, charts, and graphs illustrating the analysis outcomes will be presented.

3.8 Ethics Reflection

When doing research involving human subjects, ethical norms must be observed. There are internationally recognized ethical standards developed by research institutions and regulatory systems that are set to be followed by this study. (Babbie, 2021; Resnik, 2020) Before the data collection, the relevant research ethics committee will seek an ethical clearance to ensure that the study complies with institutional and regulatory requirements.

3.8.1 Informed Consent

Before participating, participants will get thorough information about the study's objectives, procedures, potential risks, and rights. In adherence with established ethical procedures, such information will be provided in a formal consent document where the subjects' consent will be sought in writing (Israel, 2006). Participants' autonomy and comprehension of their involvement are guaranteed.

3.8.2 Participation is Voluntary

Participation in the study will be purely voluntary. Participants will be informed of the freedom to refuse or quit the survey at any instance without repercussions. This will go against coercion and ensure free will. (Babbie, 2021)

3.8.3 Confidentiality

All the collected data will be kept strictly confidential, and only the researcher and academic supervisors can access them securely. The results will be reported in aggregate form, not to reveal individual responses, and the data will be used solely to provide education (Creswell J. W., 2018).

3.8.4 Privacy

The study will protect participants' privacy by refraining from gathering unnecessary personal data. We will not share names, phone numbers, or employment data with third parties or publish anything (Israel, 2006). Confidentiality will be observed with survey responses during and after the research.

3.8.5 Anonymity

The participants will not be identified or asked to provide their identifiers in the questionnaire to maintain their anonymity. Instead, reactions will be monitored and analyzed through coding systems. In doing so, data cannot be tied to the individual privacy is enhanced. (Resnik, 2020)

3.9 Overview of Chapter

In this chapter, I have explained the methodology to be used in carrying out the research. Research design, target population, sample plan, data collection devices, validity, reliability, and pilot testing procedures are all reported. Data analysis and presentation approaches have also been outlined. Lastly, the chapter has outlined the ethical considerations that will be observed to protect research participants' rights, dignity, and privacy. The following chapter will provide and discuss the research findings about the data obtained by Pioneer Engineering and Construction Company Ltd respondents.

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSION

4.0 Introduction

This chapter contains data from the field, research findings, and study limitations.

4.1 Reporting of the Research Results

Table 4 Response Rate

Questionnaires	**Frequency**	**Percentage (%)**
Complete Responses	70	100
Non-Responses	0	0
Total	**70**	**100**

The study posted 70 questionnaires to respondents who undertook land surveying activities within Pioneer Engineering and Construction Company Limited. The response rate was 100 percent; the 70 questionnaires were completely answered and returned. This high response rate greatly increases the validity and reliability of the results, showing the participants' high interest and engagement in the topic.

Table 5 Gender Distribution

Gender	**Frequency**	**Percentage (%)**
Male	44	62.9
Female	26	37.1
Total	**70**	**100**

The gender distribution shows that most respondents were male (62.9%), while female participants made up 37.1%. This gender inconsistency can perhaps be indicative of the general trends in the construction and land survey areas in Kenya, whereby a higher population of men is more likely to dominate the field historically. (Wachira, 2018)

Table 6 Age Distribution

Age Bracket	Frequency	Percentage (%)
18–25 years	10	14.3
26–35 years	35	50.0
36–45 years	15	21.4
46 years and above	10	14.3
Total	**70**	**100**

Most respondents (50%) fall within the 26–35 age group, suggesting a youthful yet experienced workforce. The generation associated with this age bracket may be more conversant with technologies such as GPS, drones, and GIS, which play a critical role in risk mitigation in land surveying nowadays. (Naniopoulos, 2021)

Table 7 Level of Education

Education Level	Frequency	Percentage (%)
Secondary School	20	28.6
Diploma/Certificate	25	35.7
Bachelor's Degree	20	28.6
Postgraduate Degree	5	7.1
Total	**70**	**100**

The findings show that most participants (71.4%) have attained at least a diploma or university degree, indicating a well-educated workforce capable of understanding and applying formal risk management strategies in land surveying (Akintoye, 1997).

Table 8 Years of Experience in Land Surveying

Years of Experience	Frequency	Percentage (%)
Less than 3 years	15	21.4
3–5 years	30	42.9
More than 5 years	25	35.7
Total	**70**	**100**

Most respondents (42.9%) have 3–5 years of experience, and 35.7% have more than 5 years. This implies that a significant percentage of those surveyed are well-experienced professionals with concrete exposure to project risk matters; hence, they can be considered dependable sources of information in this study.

Table 9 Risk Acceptance Strategies

Statement	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)
We sometimes proceed with minor known risks without intervention.	28	42	12	10	8
Known risks are accepted if mitigation costs are too high.	25	38	15	12	10
Internal controls are in place to monitor accepted risks.	30	40	14	10	6

The results indicate that risk acceptance is strategically applied within Pioneer Engineering. Although there is a consensus that the respondents accept low risks, this practice occurs only in cases where the risk's effect is low, or mitigation is not feasible due to cost. This concurs with the Contingency theory, which holds that decisions should be situational. (Fiedler, 1964)

Table 10 Risk Avoidance Strategies

Statement	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)
We avoid surveys in areas with unclear or disputed boundaries.	45	38	10	5	2
Preliminary site assessments are routinely conducted.	50	36	8	4	2
Projects are sometimes delayed or declined due to known external risks.	40	30	15	10	5

The data reveals an intense institutional commitment to risk avoidance by early site assessment and active risk avoidance in risky settings. This is in line with the Systems Theory view that highlights preventing failure through managing interdependencies. (Von Bertalanffy, 1968)

Table 11 Risk Mitigation Strategies

Statement	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)
We use technology like drones and RTK GPS for data accuracy.	55	35	5	3	2
We conduct regular team training on risk and safety.	50	38	6	4	2
We have SOPs and backup plans in case of disruptions.	45	40	8	5	2

The high agreement on the use of risk mitigation practices confirms that the company employs proactive and technologically driven strategies, as supported by Johnson (2021), who emphasized the role of GIS and automation in reducing operational risk in land surveying (Johnson, 2021).

Table 12 Risk Transfer Strategies

Statement	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)
The company uses insurance to cover liability during survey work.	38	42	10	7	3
Outsourcing is used to transfer specialized technical risks.	35	40	12	8	5
Contract clauses define risk responsibilities with clients or partners.	40	38	10	7	5

Insurance and other forms of risk transfer, like contractual provisions, are partially utilized. While this indicates awareness of legal and financial risk transfer, the lower levels of strong agreement suggest room for more vigorous enforcement and policy structure, consistent with Akintoye and MacLeod's (1997) recommendations on legal risk allocation (Akintoye, 1997).

Table 13 Project Performance Indicators

Statement	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)
Most projects are completed on time.	40	38	12	6	4
Survey data accuracy is consistently high.	45	40	8	5	2
Effective risk management contributes to client satisfaction in our projects.	50	35	10	3	2

The excellent rates of agreement imply that most land surveying projects are usually accomplished in the reasonably expected timescales, and the focus is on the correctness of information and the consumer satisfaction of stakeholders.

These results confirm the beneficial impact of sound risk management practices. The Project Management Institute (2021) notes that effective risk practices directly enhance project outcomes by reducing delays, rework, and disputes. (PMI, 2021) Furthermore, they support the Systems Theory perspective, which views operational performance as an output of how well system components (technology, process, personnel) are coordinated and how risk is managed holistically. (Von Bertalanffy, 1968)

4.2 Study Limitations

It involved several constraints in itself, at the same time not reducing the integrity of the research but instead shaping the experience and the extent of the study in regards to collecting data. Most of the employees in Pioneer Engineering, whose work concerned land surveying and project management, were absorbed in fieldwork and on-site work; therefore, it was a challenge to carry out the administration of the questionnaires in a scheduled and coordinated

way. Some respondents forced the researcher to make many visits or change schedules to fit the respondents' schedules.

Secondly, difficulties occurred in getting permission and clearance to carry out the study in the company. Pioneer Engineering had to issue access only through an internal review system and formal communication as an organization possessing sensitive and project-critical information. This was necessary and respected; however, it led to time pressure.

Field conditions also acted as a barrier to communication at times, given places with poor connectivity or places that were too remote to connect to the company head office. In other cases, participants asked for clarification on phrases, including "risk transfer" or "retention," necessitating the researcher to offer brief, neutral explanations without influencing their responses. This showed that technical staff members had varying expertise regarding formal risk management terminologies as the principles were applied virtually.

4.3 Chapter Summary

This chapter summarizes the key information acquired in the field as part of the questionnaires distributed to the participants. The chapter also notes the researcher's practical limitations during the fieldwork phase, such as respondent availability, logistical difficulties, and access delays. However, these limitations did not affect the quality and authenticity of the data collected.

CHAPTER FIVE

SUMMARY, RECOMMENDATIONS AND CONCLUSIONS

5.0 Introduction

The chapter will make a conclusive synthesis summarizing the overall findings of the problem, providing practical and evidence-based recommendations, and giving study-based conclusions.

5.1 Summary of Findings

The study utilized a descriptive research method based on a quantitative design. It administered standardized questionnaires among 70 technical and managerial levels of land surveying employees.

The results indicate that risk mitigation and avoidance were the two most commonly applied within the firm. A strong internal risk control system is reflected in high agreement rates on using modern surveying technology such as RTK GPS and drones, regular training on the risks, and standard operating procedures. This validates the claims made by Johnson (2021), who pointed out that using cutting-edge instruments improves the accuracy and security of land surveying activities. Also, the evidence is consistent with the Systems Theory, which points to proactive coordination of processes to prevent systemic failures. (Von Bertalanffy, 1968)

Risk acceptance was more moderate. The organization occasionally tolerates small, familiar risks, particularly those whose mitigation is not financially feasible, as confessed by a significant percentage of respondents. Nonetheless, internal monitoring tools to monitor these risks were also present. According to Fiedler (1964), this conclusion supports the Contingency Theory viewpoint, which promotes situational decision-making based on project complexity and context.

The most reported risk transfer was done through insurance policies and contractual clauses, which are not uniformly enforced. The study found that while contracts often contain liability-sharing terms, implementation is less uniform, echoing Akintoye and MacLeod's (1997) concern that legal provisions alone are insufficient without structured monitoring and accountability.

Participants in the research also believed that risk management techniques positively impacted project performance. Most respondents agreed that without good risk management, the timely completion of the project, accurate survey results, and client satisfaction would be affected.

These results support the assertion made by the Project Management Institute (2021) that the effectiveness of risk management procedures has a direct bearing on project success.

Demographic analysis revealed a predominantly youthful, technically trained, and experienced workforce, indicating that the organization's human capital is well-positioned to support effective risk management. The high response rate (100%) and strong engagement across departments further reinforced the reliability of the results.

5.2 Conclusion

This paper aimed to investigate how project risk management strategies would apply to land surveying. As such, it considered the four main risk management approaches, which include risk acceptance, risk avoidance, risk mitigation, and risk transfer. The aim of the research, taking Pioneer Engineering and Construction Company Ltd. as a case study, was to establish how these strategies are put into practice and the impact they have on project performance in terms of timeliness, accuracy, and client satisfaction.

This study has been informed by the knowledge incorporated in most construction and development projects that land surveying is a core component that is inevitably open to technical, environmental, legal, and operating risks. (Akintoye, 1997; Wachira, 2018) When these risks are not effectively addressed, they may result in severe delays, cost overruns, and project conflicts, compromising national development plans like Kenya Vision 2030.

Seventy land surveying professionals were sampled through a descriptive study design and a structured questionnaire. The results indicate that Pioneer Engineering is deeply concerned with avoiding and reducing risks, including applying pre-survey risk assessment, safety practices, and modern technological equipment surveying tools. Risk acceptance is situation-specific and is typically used in cases where the prevention costs seem more than the potential impact. Although risk transfer was recognized, it was not consistently imposed, particularly about the combination of insurance and contractual securities.

The findings also demonstrated a favorable correlation between enhanced project performance and effective risk management, bolstering project management and systems thinking theories prioritizing proactive planning and integrated process management (Von Bertalanffy, 1968; PMI, 2021). Furthermore, the organization is well-positioned to implement and maintain these policies due to the workforce's demographic composition, which is defined by technical training and mid-level experience.

5.3 Recommendations

5.3.1 Practice Implications

The study states that risk acceptance and transfer are not always factored into project planning and execution despite the high-risk avoidance and mitigation use. Pioneer Engineering and Construction Company Ltd. should solve this by institutionalizing a comprehensive risk management framework. Based on the type of project, the level of risk, and the resources available, this framework is expected to detail how each risk strategy, the acceptance, avoidance, mitigation, and transfer, are to be applied. The Project Management Office needs to formulate and implement this structure within three months alongside the legal and operational departments. Two methods of monitoring that should be employed to ensure adherence are standardized risk checklists and internal audits.

5.3.2 Policy Implications

Formally incorporating risk management within the organization's internal project policies is necessary. All land surveying projects should obligatorily have risk documentation as part of planning and closure. To be more specific, every project proposal should include a risk register, and post-project monitoring should examine the effectiveness of risk strategies. This amendment to the policy will enhance a culture of continuous improvement and accountability. The organization's senior management team must oversee the reporting template modification and ensure the project managers know the changed specifications. When policy implementation starts immediately, the quality assurance team should conduct semiannual policy reviews to determine their adherence to policy.

5.3.3 Training and Education Implications

The study concluded that employees demonstrated expertise in using technology to mitigate risk but required greater exposure to structured risk appraisal methodologies, especially in financial and legal risk transfer strategies. To bridge this gap, the Human Resource Department should regularly host capacity-building programs in collaboration with trade associations like the Institution of Surveyors of Kenya (ISK). These training sessions should mainly focus on applying such tools as risk matrices and decision trees, the partitioning of risk in the contract, and the role of insurance in the risk management process. Training effectiveness should be measured using knowledge evaluations, performance reviews, and other project documentation advancements. The trainings are supposed to be quarterly.

5.3.4 Research Implications

The researcher proposes a further investigation of the external risk factors in land surveying even though this study was limited to internal risk procedures. Despite its significance, political, regulatory, and environmental risks were outside the scope of this inquiry. Pioneer Engineering should consider collaborating with local institutions of higher learning or research centers to study these broader problems. To enhance the resiliency of surveying activities, such a study is needed to define macro-level hazards and propose technical or policy solutions. These projects would be evaluated based on academic output and the incorporation of the discovery into the policy or practice of an organization. They might begin during the fall season of the forthcoming academic year.

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APPENDIX I: INTRODUCTION LETTER

Pioneer Engineering & Construction Co. ltd,
P.O. Box 7386-00100,
Nairobi, Kenya.

Dear Sir/Madam,

RE: Research Data Collection

My name is Mercy Muthoni Maringa, a student at the Management University of Africa with registration number ODLBDS/29/00427/1/23. I am a student pursing a bachelor's of art in development studies – Project Management specialization and for successful completion of my course work I am supposed to conduct a research project. This is a request letter aiming at seeking the management of Pioneer Engineering and Construction co. ltd to help me through its staff to conduct my academic research study on the topic; **Risk Management Strategies in Land Surveying in an Engineering and Construction company.**

I will be grateful if my request will be granted and I will appreciate any assistance that will be granted to me

Yours' Faithfully,

…….

Mercy Muthoni Maringa.

APPENDIX II: QUESTIONNAIRE

Kindly, fill this questionnaire correctly in spaces provided that will collect information in relation to: **RISK MANAGEMENT STRATEGIES IN LAND SURVEYING: A CASE STUDY OF PIONEER ENGINEERING AND CONSTRUCTION COMPANY**

PART A: PERSONAL INFORMATION

1. Indicate your gender

   Male ( )
   Female ( )

2. Indicate your age bracket

   18–25 Years ( )
   26-35 Years ( )
   36-45Years ( )
   46 years and above ( )

3. Indicate your highest level of educa1tion

   Secondary Level ( )
   Diploma/ Certificate ( )
   Bachelor’s Degree ( )
   Postgraduate Level ( )

4. Indicate your Length of Service in this institution

   Less than 3 years ( )
   3-5 years ( )
   5 years & above ( )

SECTION B: RISK ACCEPTANCE STRATEGIES

5. Rate the below statements on risk acceptance strategies in land surveying.

Scale 1=strongly disagree 2= disagree 3= undecided 4= agree 5=strongly agree.

	1	2	3	4	5
We sometimes proceed with minor known risks without intervention.					
Known risks are accepted if mitigation costs are too high.					
Internal controls are in place to monitor accepted risks.					

SECTION C: RISK AVOIDANCE STRATEGIES

6. Rate the below statements on risk avoidance strategies used in land surveying.

Scale 1=strongly disagree 2= disagree 3= undecided 4= agree 5=strongly agree.

	1	2	3	4	5
We avoid surveys in areas with unclear or disputed boundaries.					
Preliminary site assessments are routinely conducted.					
Projects are sometimes delayed or declined due to known external risks.					

SECTION D: RISK MITIGATION STRATEGIES

7. Rate the below statements on risk mitigation strategies in land surveying.

Scale 1=strongly disagree 2= disagree 3= undecided 4= agree 5=strongly agree.

	1	2	3	4	5
We use technology like drones and RTK GPS for data accuracy.					
We conduct regular team trainings on risk and safety.					
We have SOPs and backup plans in case of disruptions.					

SECTION E: RISK TRANSFER STRATEGIES

8. Rate the below statements on risk transfer strategies in land surveying.

Scale 1=strongly disagree 2= disagree 3= undecided 4= agree 5=strongly agree.

	1	2	3	4	5
The company uses insurance to cover liability during survey work.					
Outsourcing is used to transfer specialized technical risks.					
Contract clauses define risk responsibilities with clients or partners.					

SECTION F: PROJECT PERFORMANCE INDICATORS

9. Rate the below statements on project performance indicators in land surveying.

Scale 1=strongly disagree 2= disagree 3= Neutral 4= agree 5=strongly agree.

	1	2	3	4	5
Most projects are completed on time.					
Survey data accuracy is consistently high.					
Effective risk management contributes to client satisfaction in our projects.					