

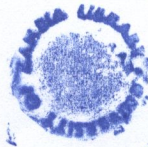
**MANAGEMENT OF RISKS IN THE  
IMPLEMENTATION OF PUBLICLY  
FUNDED ROAD CONSTRUCTION  
PROJECTS IN ZAMBIA**

**By**

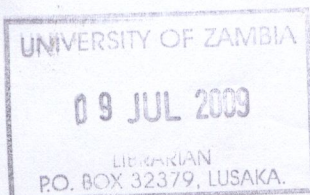
**Kanyuka Mumba**

THESIS  
M-ENG  
MUM  
2008  
C.1

**A dissertation submitted in fulfilment of the  
requirements for the degree of  
Master of Engineering in Construction Management**



**The University of Zambia  
School of Engineering  
June, 2008**





## DECLARATION

---

I, **KANYUKA MUMBA**, do hereby declare that this dissertation is entirely the outcome of my own work and that to the best of my knowledge, it has never been presented for a degree at this or any other university. All figures and tables, except those whose sources have been acknowledged, are original.

SIGNED: .....

DATE: 30/06/08.....

LUSAKA, ZAMBIA.

# APPROVAL

This dissertation of Kanyuka Mumba is approved as fulfilling the partial requirements for the award of the degree of Master of Engineering in Construction Management by the University of Zambia.

00000000

NAME

SIGNATURE

Daniel Rahn

Daniel Rahn

External Examiner

Dr. Mwindu Mumba

© 2008 by Kanyuka Mumba. All rights reserved

Supervisor and Internal Examiner

Dr. Michael W. Mubanga

[Signature]

Internal Examiner

Dr. C.K. WAMUKWAMBA

[Signature]

Dissertation Chairperson



# APPROVAL

This dissertation of Kanyuka Mumba is approved as fulfilling the partial requirements for the award of the degree of Master of Engineering in Construction Management by the University of Zambia.

NAME

SIGNATURE

Daniel Rahn

External Examiner

[Signature]

Dr Mundia Mya

Supervisor and Internal Examiner

[Signature]

Dr. Michael N. Mubanga

Internal Examiner

[Signature]

DR. C.K. WAMUKWAMBA

Dissertation Chairperson

[Signature]



## ABSTRACT

---

The Government of the Republic of Zambia (GRZ) has over the last decade made considerable effort in improving road infrastructure in the country. However, the implementation of many road projects has not been as successful as expected. One of the major factors is poor risk management on the projects. Evidence suggests that in many road contracts in the country, risk is by and large ignored, dealt with in an arbitrary way or with complacency, causing a significant number of road construction projects to take longer or cost more than planned, or even fail. On the whole, the construction industry worldwide has a poor reputation for dealing with risk.

The main aim of the study was to develop a risk management model for application on public funded road projects in Zambia. The specific objectives of the research were to analyse selected projects to determine project risks and the extent to which risk analysis and management were applied.

Various data collection techniques were utilised in the research, notably, questionnaire surveys, structured interviews, case studies and document reviews.

The model was developed and validated through stakeholder inputs, and is thus recommended for use on Zambian road projects. The research further analysed the effect of lack of effective risk management on implementation and overall management of projects. Subsequently, a risk inventory (RI) was developed.

Results showed that structured risk management on many projects in Zambia was lacking. The five (5) main risks identified in the study were: funding risks; natural hazards; inadequate designs for works; political interference risks; and shortage of materials.

Structured risk management is highly recommended as an integral part of any road project in Zambia. This will facilitate monitoring and control of major risks on the projects, with the ultimate benefit of increased project success.



The information brought out in this study may prove invaluable to Government, its cooperating partners, contractors, consultants and all other stakeholders in the road sector

**Keywords:** Project Risk, Risk Inventory, Risk Management Model, Public Funded Projects



## ACKNOWLEDGEMENTS

---

First and foremost, my deepest gratitude goes to my supervisor, Dr. Mundia Muya, for his guidance and patience in reading and correcting my many draft submissions. I particularly am grateful for his edifying supervision, beneficial critique, suggestions, encouragement and overall direction during the study.

Through the duration of the study, various other people made useful contributions and special thanks go to Dr. Mike N. Mulenga and the entire School of Engineering management for their support, ideas and facilities made available.

I would also like to thank one of my mentors, Mr. Ian Nzali Banda, for his encouragement before and during study for the masters programme. Special thanks also go to Mr. Joseph Mwewa for his guidance and support. Without them, I may not have had enough conviction to go ahead and enrol for the programme.

Heartfelt gratitude goes to my beloved wife, Nancy Nambeye Mumba for her unwavering support throughout the study. The list would not be complete if I did not mention my little daughter, Juanita, whose presence gave me the encouragement to persevere.

Lastly and most importantly, I thank the Almighty God for giving me the wisdom and strength to attain my ambitions. For in all that we do, if we exclude the Lord, we labour in vain.



## TABLE OF CONTENTS

---

	PAGE
DECLARATION	
APPROVAL	
ABSTRACT .....	v
ACKNOWLEDGEMENTS .....	vii

### CHAPTER 1: INTRODUCTION

1.0	Background .....	1
1.1	Statement of the problem .....	3
1.2	Rationale .....	9
1.3	Research aim and objects .....	10
1.4	Research delineation .....	11
1.5	Dissertation layout .....	11

### CHAPTER 2: LITERATURE REVIEW

2.0	Introduction .....	13
2.1	The risk management process .....	15
2.1.1	Project phases and risk .....	16
2.1.1.1	Risk in project appraisal .....	17
2.1.1.2	Risk in funding decisions .....	18
2.1.1.3	Risk in contracts .....	19
2.1.1.4	Risk during bidding .....	20
2.2	Benefits of project risk management .....	21
2.3	Risk management activities .....	22
2.3.1	Risk identification .....	23
2.3.2	Risk assessment .....	23
2.3.3	Risk treatment .....	24
2.3.4	Risk monitoring and review .....	25
2.3.5	Communication and consultation .....	26
2.3.6	Summary .....	27

**CHAPTER 3: RESEARCH METHODOLOGY**

- 3.0 Introduction .....31
- 3.1 Research methodologies ..... 31
  - 3.1.1 Research families or strategy ..... 32
    - 3.1.1.1 Qualitative research ..... 32
    - 3.1.1.2 Quantitative research ..... 32
    - 3.1.1.3 Mixed research ..... 32
    - 3.1.1.4 Desk and fieldwork research ..... 33
  - 3.1.2 Approaches to designing research projects ..... 33
    - 3.1.2.1 Action research ..... 34
    - 3.1.2.2 Case study ..... 34
    - 3.1.2.3 Ethnographic style .....34
    - 3.1.2.4 Surveys ..... 35
    - 3.1.2.5 Experimental style ..... 35
    - 3.1.2.6 Narrative inquiry ..... 35
    - 3.1.2.7 Historical research ..... 35
    - 3.1.2.8 Ex post facto research .....35
    - 3.1.2.9 Experiments, quasi-experiments and single-case  
research .....36
  - 3.1.3 Techniques for data collection ..... 36
  - 3.1.4 Triangulation ..... 37
- 3.2 Research design and methodology ..... 40
  - 3.2.1 Selection of research methodology ..... 40
  - 3.2.2 Instruments for collecting data in the research ..... 41
- 3.3 Case study design ..... 42
  - 3.3.1 Desk research ..... 43
  - 3.3.2 Field survey research ..... 44
  - 3.3.3 Field observations ..... 44
  - 3.3.4 Data analysis ..... 45
  - 3.3.5 Qualitative analysis..... 45
  - 3.3.6 Quantitative analysis ..... 46
- 3.4 Summary ..... 47



**CHAPTER 4: STRUCTURED INTERVIEWS ANALYSIS AND  
DISCUSSION OF RESULTS**

4.0	Introduction .....	48
4.1	Analysis and discussion of results for structured interviews .....	48
4.1.1	General information on interviewees and firms .....	49
4.1.2	Brief overview of projects .....	51
4.1.2.1	Budget overruns .....	51
4.1.2.2	Schedule overruns .....	52
4.1.2.3	Poor quality works .....	53
4.1.2.4	Key factors that contribute to projects failing to meet desired objectives .....	54
4.1.2.5	Disputes or litigation due to occurrence of risks on projects .....	55
4.1.2.6	Prevalence of projects failing to meet objectives .....	55
4.1.3	Existing risk management practices .....	56
4.1.3.1	Provision for management of risks on projects .....	56
4.1.3.2	Documented risk management processes in organisations .....	56
4.1.3.3	Ownership of risk management .....	57
4.1.3.4	Application of risk management at all project stages.....	57
4.1.3.5	Implementation of formal risk management .....	58
4.1.4	Risk identification and assessment .....	58
4.1.4.1	Analysis of funding risks .....	58
4.1.4.2	Assessment of natural risks .....	59
4.1.4.3	Design risks .....	59
4.1.4.4	Risks likely to occur on projects .....	59
4.1.4.5	Dealing with occurrence of risks on projects during implementation .....	60
4.1.4.6	Sum added to contract amount to deal with risks.....	61
4.1.4.7	Ranking of organisations' risk management practices.....	62
4.1.4.8	Allocation of funds to support risk management.....	62
4.1.4.9	Insights or comments on risk management on road projects in Zambia .....	63

4.2	Summary .....	63
-----	---------------	----

## CHAPTER 5: QUESTIONNAIRE SURVEY ANALYSIS AND DISCUSSION OF RESULTS

5.0	Introduction .....	64
5.1	Profile of respondents .....	66
5.1.1	Position of respondents in firm.....	66
5.1.2	Years of employment in organisation .....	67
5.1.3	Experience of interviewees in road sector .....	67
5.1.4	Number of projects managed .....	68
5.1.5	Highest level of education .....	69
5.1.6	Formal training in risk management .....	70
5.2	Profile of organisation .....	71
5.2.1	Type of organisation .....	71
5.2.2	Years of existence of organisation .....	72
5.2.3	Number of road projects since inception .....	73
5.2.4	Type of projects .....	74
5.3	Overview of projects implemented .....	75
5.3.1	Road projects not completed within original budget .....	75
5.3.2	Road projects not completed within original schedule.....	76
5.3.3	Road projects that failed to meet the required standard or design .....	77
5.3.4	Allocation of funds for the risk management function .....	78
5.4	Understanding project risk management .....	78
5.4.1	Common understanding of project risk management in organisation .....	78
5.4.2	Documented project risk management procedures and guidance to staff .....	79
5.4.3	Responsibility for project risk management in organisation .....	80
5.4.4	Risk management tool kits or software .....	81
5.5	Risk identification .....	82
5.5.1	Identification of main potential risks .....	82
5.5.2	Type of risks identified .....	83
5.5.3	Risk register or database .....	84



5.6	Risk assessment and treatment .....	85
5.6.1	Provision for risk in contracts .....	85
5.7	Risk monitoring and review .....	86
5.7.1	Effectiveness of risk management controls in place .....	86
5.8	General insights .....	87
5.9	Summary .....	88

**CHAPTER 6: PROPOSED MODEL FOR RISK MANAGEMENT**

6.0	Introduction .....	90
6.1	Proposed model for risk management .....	90
6.2	Process for risk management .....	91
6.2.1	Project inception .....	91
6.2.2	Form risk management team .....	91
6.2.3	Evaluate salient project information .....	91
6.2.4	Screen and identify probable risks .....	91
6.2.5	Presence of risks .....	91
6.2.6	Identify assumptions and scenarios .....	92
6.2.7	Evaluate and quantify risks .....	92
6.2.8	Rank the risks .....	92
6.2.9	Decision to implement project .....	94
6.3	Top five risks .....	94
6.3.1	Funding risks .....	96
6.3.2	Natural hazard risks.....	96
6.3.3	Design risks .....	97
6.3.4	Political risks .....	97
6.3.5	Materials shortage risks .....	97
6.4	Validation of the risk management model .....	97
6.5	Analysis and discussion of the validation questionnaire results.....	98
6.5.1	General information on respondent and firm.....	98
6.5.2	Validation results.....	99
6.6	Summary.....	104

**CHAPTER 7: CONCLUSION AND RECOMMENDATIONS**

7.0 Introduction ..... 105

7.1 Conclusion ..... 105

7.2 Study limitations..... 108

7.3 Recommendations .....109

**REFERENCES ..... 111**



## LIST OF FIGURES

---

Figure 1.1: Location of Zambia .....	1
Figure 1.2: Summary of chapters .....	12
Figure 2.1: Summary of risk management process .....	27
Figure 4.1: Type of organisations that participated in the interview .....	50
Figure 4.2: Positions of interviewees in their organisations.....	50
Figure 5.1: Position of respondents in organisations.....	66
Figure 5.2: Years of employment of respondents in firm.....	67
Figure 5.3: Years of experience of interviewees.....	68
Figure 5.4: Number of projects managed by respondents.....	69
Figure 5.5: Highest level of education of respondents.....	70
Figure 5.6: Formal training of respondents in risk management .....	71
Figure 5.7: Type of respondent organisations.....	71
Figure 5.8: Years of existence of respondent organisations .....	73
Figure 5.9: Number of road projects handled by respondent organisations.....	74
Figure 5.10: Type of projects handled by respondent organisations.....	74
Figure 5.11: Projects not completed within budget by respondent organisations.....	75
Figure 5.12: Projects not completed within schedule by respondent organisations.....	76
Figure 5.13: Projects not meeting specified quality standards.....	77
Figure 5.14: Level of agreement by respondents with willingness to allocate funds for risk management .....	78
Figure 5.15: Level of agreement by respondents with existence of clear policy on project risk management in their organisations .....	79
Figure 5.16: Level of agreement by respondents with existence of documented project risk management processes in their organisations .....	80
Figure 5.17: Level of agreement by respondents with existence of clearly defined responsibility for project risk management in their organisations .....	81
Figure 5.18: Level of agreement by respondents regarding use of risk management toolkits in their organisations .....	82
Figure 5.19: Level of agreement by respondents regarding identification of main risks by their organisations .....	83
Figure 5.20: Does respondent organisation keep risk register or database? .....	85
Figure 5.21: Does your organisation provide 10% contingency in contract documents as a risk management measure? .....	85
Figure 5.22: Does your organisation review effectiveness of risk management	

controls? .....	86
Figure 6.1: Risk ranking matrix .....	95
Figure 6.2: Position of respondents in the respective organisations .....	98
Figure 6.3: Respondents' level of agreement with steps in model for managing risks .....	99
Figure 6.4: Level of agreement with model user friendliness .....	100
Figure 6.5: Respondents' level of agreement with usefulness of model .....	100
Figure 6.6: Respondents' level of agreement with willingness to employ model on Projects.....	101
Figure 6.7: Model for managing risks on road projects in Zambia .....	103



## LIST OF TABLES

---

Table 1.1: Performance of Selected Projects.....	5
Table 2.1: Process tasks in risk management .....	16
Table 2.2: Various project risks identified in reviewed literature .....	28
Table 2.3: Content analysis of risk literature reviewed .....	29
Table 3.1: Research methods and features .....	39
Table 3.2: Summary of research design and methodology .....	42
Table 4.1: Risks likely to occur on projects .....	60
Table 5.1: Type of risks identified.....	84
Table 6.1: Risk description table .....	96
Table 7.1: Risk description table.....	108

**LIST OF APPENDICES**

---

Appendix A: Structured Interviews Guide ..... 115

Appendix B: Questionnaire on Risk Management Practices ..... 119

Appendix C: Model validation questionnaire ..... 127

## **LIST OF ABBREVIATIONS**

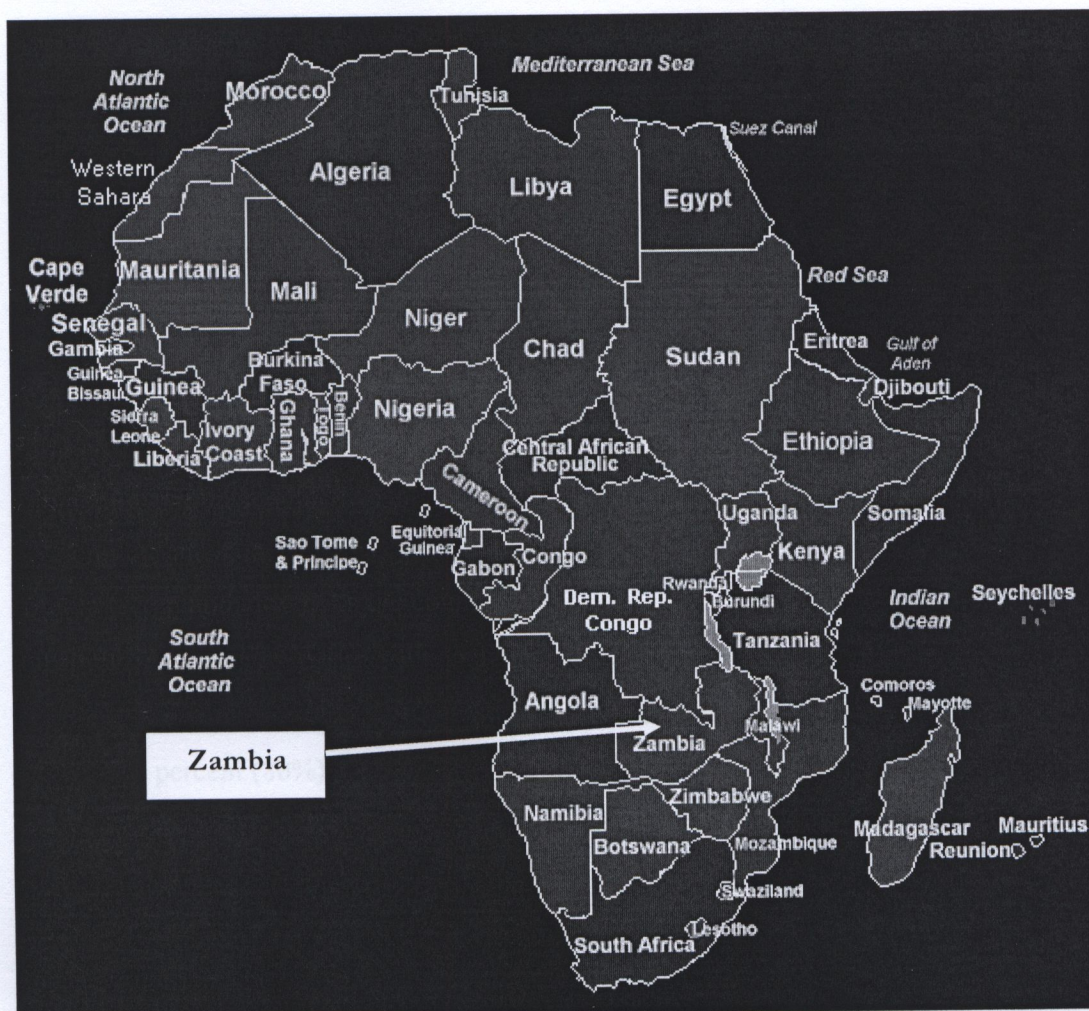
---

ACEZ – Association of Consulting Engineers of Zambia  
CCC – Consolidated Contractors Company  
DANIDA – Danish International Development Agency  
DISS – Department of Infrastructure and Support Services  
EU – European Union  
FIDIC – International Federation of Consulting Engineers  
GRZ – Government of the Republic of Zambia  
MLGH – Ministry of Local Government and Housing  
MoWS – Ministry of Works and Supply  
NCC – National Council for Construction  
NORAD – Norwegian Development Agency  
NRFA – National Road Fund Agency  
RAM – Risk Analysis and Management  
RAP – Risk Action Plan  
RD – Roads Department  
RDA – Road Development Agency  
RMI – Road Maintenance Initiative  
RoadSIP – Road Sector Investment Programme  
SIDA – Swedish International Development Agency  
SSATP – Sub-Saharan African Transport Programme  
USD – United States Dollar  
WB – World Bank  
ZMK – Zambian Kwacha

## CHAPTER 1: INTRODUCTION

## 1.0 Background

transport for trading activities with its neighbours.



**Figure 1.1:** Location of Zambia (Source: [www.africaguide.com](http://www.africaguide.com))

Zambia's road network comprises approximately 37,000 km of gazetted roads and approximately 30,671 km of ungazetted roads. The ungazetted roads can be classified into feeder, national parks and estate roads (National Task Force, 2003).



The entire road network falls under the jurisdiction of one coordinating semi-autonomous agency, the Road Development Agency (RDA) established by the Public Roads Act of 2002. By this Act, the functions, among others, of the RDA are to plan, manage and coordinate the road network in the country, which includes maintenance and construction of public roads through its employees or independent contractors (Public Roads Act, 2002). The public roads are classified as: inter-territorial (formerly Trunk) and territorial main (formerly Main), secondary (formerly district), and tertiary (branch, urban, rural, estate and park) roads.

Since the country attained independence in 1964, the focus of the Government of the Republic of Zambia (GRZ) in the first three National Development Plans (up to 1983) was mainly concentrated on the construction of new roads. The basic objective and emphasis, among others, of the First, Second and Third National Development Plans was to open up the country for economic development and improved communication by linking the country side to major towns.

Additionally, trunk roads were constructed linking the country to its neighbours to foster trade, communication and economic interaction. Subsequently, the length of the road network increased considerably to over 67,000 km, valued at over USD 2.3 billion, during the implementation of these Plans.

Over time, the road network fell into a state of disrepair. By the beginning of the 1990s, the condition of the road infrastructure had deteriorated to such an extent that over eighty percent (80%) of the entire road network was in poor condition (National Task Force, 2003). This could be ascribed to poor or lack of a comprehensive road maintenance programme, as little emphasis was put on routine and periodic maintenance of roads. Instead the bulk of the expenditure on roads was on capital intervention, which entailed rehabilitation of failed road sections. At this stage the value of periodic and routine maintenance may not have been appreciated as a way of prolonging the service life, and thus reducing the incidences of capital intervention. This lack of appropriate and sustainable road maintenance policies and programmes led to gradual deterioration of the road network, resulting in a declined value of the investment. For instance, at the end of the seventies, although the road network was valued at USD 2.3 billion, only about 40-50% was in good condition.

Owing to neglect of maintenance, the value of Zambia's road network had shrunk to about USD 1.5 billion by the start of the nineties, with only about 20% of the road network in good condition (RoadSIP II Bankable Document, 2003).

It became clear that without preventive maintenance, very few roads were attaining their design life spans, and that the maximum benefit of the investment in roads was not realised. As the cost of rehabilitating failed roads increased, Government's ability to provide funding for rehabilitation diminished. It was evident that unless measures were taken to address the worsening condition of the road network, even the condition of the remaining good roads would deteriorate. A policy framework within the realms of the road sector to govern the planning, implementation and management of road maintenance and rehabilitation needed to be established.

In 1993, Government embraced a policy (the Road Maintenance Initiative or RMI) in the Road Sector that facilitated the restructuring of the then Roads Department and the Local Authorities to streamline their operations. The RMI is a World Bank (WB) sponsored initiative under the auspices of the Sub-Saharan African Transport Programme (SSATP). The mode of management of the road infrastructure changed from the traditional "Force Accounting" to the "Contract System", which introduced a more significant involvement of the private sector in the maintenance of roads. These measures were intended to improve the road projects management system in the country.

Thus, the road agencies were transformed from being the primary executors of road works to being supervisory departments. At the same time, capacity building programmes were implemented, in order to create the much-needed expertise for the new environment.

### **1.1 Statement of the problem**

The Road Sector is one of the key areas of any nation's development. Most development activities rely on a good road network for their success. Agriculture, tourism, industrial and socio-economic activities all depend on a reliable road network.

The Government of the Republic of Zambia (GRZ) has over the last decade made considerable efforts in improving road infrastructure in the country. Associated with this undertaking has been the need for enormous financial expenditure, which has in turn imposed inordinate pressure on the country's limited resources. Equally, huge foreign financing through loans or grants has been committed to the Road Sector. It was estimated that United States Dollars (USD) 878.81 million would be disbursed within the 5-year span (2003-2007) of RoadSIP II (National Task Force, 2003).

However, the implementation of many road projects has not been as successful as expected for various reasons. According to National Council for Construction (NCC) (2000), the then Republican Vice President, during the official opening of the RoadSIP Mid-term Review Workshop in December 2000, warned local consultants and contractors that the Government would not tolerate poor quality workmanship.

Concerns of poor performance in the road construction sector have also been raised in Parliament (NCC, 2002) and by senior government officials (Sunday Post, 2005).

From available information from the RDA, there seems to be a consistent pattern of projects costing more than planned, taking longer than planned or even being terminated before commencement or during implementation. This situation is a source of concern and needs urgent measures to address it.

Selected projects are highlighted in Table 1.1 below to underscore the level of the problem.

**Table 1.1:** Performance of selected projects

	Name of Project	Start Date	Original Finish Date	Revised Finish Date	Original Contract Sum (K'Billion)	Final Contract Sum (K'Billion)	Remarks
1.	Mutanda-Kasempa	Feb. 1997	Feb. 1999	Dec. 2000	15.4	25.8	Beyond budget, beyond schedule
2.	Luanshya-Mpongwe	Nov. 1994	Jan. 1997	Dec. 2001	10.1	14.5	Beyond budget, beyond schedule
3.	Choma-Namwala	Nov. 1994	Feb. 1998	Nil	9.98	34.4	Beyond budget, incomplete work. Terminated in 2008
4.	Mpika-Chinsali	Mar. 1999	Mar. 2000	Nov. 2000	7.8	7.8	Beyond schedule
6.	Chinsali-Nakonde	Apr. 1999	Jul. 2000	Nov. 2000	7.99	7.99	Beyond schedule
7.	Kashikishi-Lunchinda	Jun. 2001	Jan. 2003	Nil	150.00		Incomplete work
8.	Chambeshi-Chinkobo	Feb. 2001	Aug. 2001	Nil	5.39		Failure to commence
9.	Mpika-Muwele	June 2001	Dec. 2001	Nil	5.2		Failure to commence
10.	Lusaka-Mongu	Jan. 2003	Jul. 2005	On-going	97.0	101.3	Beyond budget, beyond schedule
11.	Nyimba-Katete	Oct. 2003	Oct. 2004	Jul. 2005	19.6	23.5	Beyond budget, beyond schedule
12.	Mpika-Kasama	Jun. 2001	Dec. 2002	Nil	9.5		Beyond schedule
13.	Kasama-Luwingu	Oct. 2001	Nov. 2003	Nil	140.0		Beyond schedule. Terminated in 2008

Source: Projects Progress Report (Roads Department, 2002), Projects Progress Report (RDA, 2005)



Factors that contributed significantly to the problems on the projects are as follows:

- lack of funding (either mid-stream or at sanctioning);
- foreign currency fluctuations;
- national fuel shortages;
- vandalism on works;
- quarry stoppages;
- wash-aways on works; and
- additional works not originally anticipated.

In general, one or a combination of the following can be sources of risk (Nasir et. al., 2003):

- environmental, such as history of precipitation;
- geotechnical, such as unexpected subsurface conditions;
- labour, such as labour disputes/ strikes;
- owner, such as financial stability;
- design, such as design specification and completeness;
- area conditions, such as site location;
- political, such as project being stopped or abandoned entirely;
- contractor, such as experience and plant; and
- materials, such as non-availability.

The latest in the series of projects that have experienced severe implementation bottlenecks is the Mongu-Kalabo Road Project, in the Western Province of Zambia. According to the NCC (2004) constructed sections of the road had been washed away by floods caused by heavy rainfall experienced in the Barotse Plains in Western Province. It was apparent that the feasibility study did not take into account the possible effects of high water levels. Consequently, the country had lost financial resources and would have to incur additional expenditure in remedial measures. Further, the NCC expressed concern at the continued loss of reputation by the industry.

From available literature, it is clear that one cardinal factor that has affected the success rate of road projects is poor project management. Within the project

management aspect, the component of project risk management can be singled out as being neglected to a very large extent. Evidence suggests that in many road contracts in the country risk is, by and large, ignored or dealt with in an arbitrary way or with complacency.

In fact, the problem appears to be worldwide. Henriod et al. (2000) observe that Worldwide, the industry has a poor reputation for coping with risk. There are several reasons why risk analysis is not performed on projects: they range from casual approach or 'laissez-faires' attitude towards the identification, assessment and management of potential risks (Thompson et al., 1992) to ignorance and doubts on the suitability of risk management techniques on the construction industry (Syed et al., 2001).

When risk occurs on a project, the following are the likely effects (Thompson et al., 1992):

- an increase in the project costs due to changes in the design and variation orders;
- a considerable loss of time, and thus, costly extensions of the implementation period due to disruption of the works;
- compromised standard of performance or quality of the project output; and
- abandonment of the project by the contractor due to the severity of the effects, and the financial implications thereto.

The rate of occurrence of the factors mentioned above on projects is alarming. Results from a survey conducted in late 1994 by P.A. Consulting Group to establish the performance and management's approach to risk management in U.K. based companies revealed the following (Coppendale, 1995):

- over 40% of the respondents said that more than half their projects exceeded initial budget or schedule;
- nearly 55% said that a recent project in their organisation exceeded budget or schedule by more than 100%;
- more than 66% said that a recent project undertaken by their organisation had either been abandoned before completion, or significantly failed to achieve the planned benefits;

- more than 60% rated their organisation's risk management to be "poor".

Due to the occurrence of these 'unexpected' events, construction projects will often require additional funding not initially anticipated due to revised designs, or will take substantially longer than scheduled. The Mongu-Kalabo Road had to be suspended to allow for the engagement of a new consultant and subsequent re-design (Post Newspaper, 2005). In the worst case scenario, a contractor may abandon a project altogether. The Mongu-Kalabo Road project cited above, at one stage, had been abandoned by the contractor due to poor management of risks.

These factors, among others, have cost the Government colossal sums of money and a loss of potential benefits on its investment. GRZ had spent USD 20 million on the Mongu-Kalabo Road up to the time the project had been abandoned (Post Newspaper, 2005), and it was estimated that USD 41.5 million would be spent to complete the project (Times of Zambia, 2005).

When risk occurs, contractors are sometimes made to absorb the unbudgeted costs of repair. In the case of the Mongu-Kalabo road, the position of the government was that those parts of the road that had been washed away were going to be corrected by the contractor, Consolidated Contractors Company (CCC), at his cost pursuant to contract conditions (The Post Newspaper, 2005).

Where a level of consideration for risk is given, the traditional practice has been to merely add a "Contingency" of 10% to the total estimated or tendered cost of a project (Thompson et al., 1992). There is, however, no realistic basis for this figure and there is virtually no indication of what risk is being considered. In many cases, this allowance for risk has proven to be inadequate and in certain instances has been the cause of costly delays due to disputes over claims, with the disputes eventually escalating to litigation and even bankruptcy.

Further, due to inadequate provision for risks in tender documents, a tendency has emerged among Zambian contractors to adopt two parallel pricing structures for Government-funded and donor-funded projects. Contractors tend to inflate their prices to, among other things, 'cater for risks' in an arbitrary way when tendering for

projects funded by the Zambian Government. The reason could be that Government takes longer to pay, which critically affects the contractor's cash flow. Available information also shows that government sometimes fails to meet its ten (10) percent counterpart funding obligation on projects co-funded with donors. The factor used to inflate the bid price, which acts as an inherent or silent interest chargeable to Government 'compensates' the contractor for any losses suffered due to delayed payments, and subsequent extended contract durations with associated costs. This, in itself, is an informal way of dealing with risks.

For instance, the Roads Department (RD) had established that bids from local contractors were on average 40-60% higher than their foreign counterparts (NCC, 2001). The second president of Zambia during his reign also alluded to over-pricing and that bids from local contractors were unrealistic (Zambia Daily Mail, 2000).

Thompson et al. (1992) state that the greatest uncertainties on a project are in its early stages, at which time critical decisions are also made. Indications are that the concept of "Risk Analysis and Management" or RAM has not been fully appreciated in the Zambian Road Sector, to the extent that projects are conceived, planned and implemented without due regard to the identification, meticulous analysis and management of cardinal risks.

Risks can occur at any stage of a project, and many project managers and contractors seem unaware that the application of Risk Analysis and Management at all stages of a project, for example, feasibility study, design and implementation, can mitigate the costly and persistent cases of protracted or failed projects (Queensland Govt., 2004).

Needless to say, the Road Sector is key to national development, and any failures on such developmental programmes are met with hostile political and social upheavals.

## **1.2 Rationale**

Through the provisions of the Road Development Agency (RDA) Act, the Government of the Republic of Zambia has bestowed the responsibility of maintaining and administering the country's road network on the RDA, which falls under the Ministry of Works and Supply (MoWS).



Through continued restructuring exercises, the Government hopes to develop a crop of project managers that possess adequate expertise to run projects efficiently and cost-effectively. Where the requisite expertise is lacking, the Government utilises the services of consultants.

The predecessors of the RDA, i.e, the Roads Department (RD) and the Department of Infrastructure and Support Services (DISS), which fell under the Ministry of Local Government and Housing (MLGH), had seen the implementation of a myriad of road projects countrywide. However, little emphasis or attention has been rendered to the existence of risks during project conception and implementation. Most project managers overlook this cardinal aspect, and most road construction projects are thus undertaken without risk management.

Indications from the literature reviewed are that the current system of handling or undertaking projects does not include a rigorous assessment and management of risks. The contract models and bidding systems used are so rigid or too traditional that they do not allow for the proper management and allocation of risks, thus further contributing to the practice of overlooking the significance of risk management.

It is thus clear that a mechanism needs to be instituted that recognises the importance of risk analysis and management and that allows for this important exercise to be carried out at all stages of a project. Further, it is hoped that project financiers will make risk analysis and management an obligatory and integral part of projects before sanctioning and during the life span of the projects.

The current state of affairs thus begs for an investigation of the extent in the application of risk management techniques, if any, and the effects of their absence. It is for this reason that this study is being undertaken to address the problem.

### **1.3 Research aim and objects**

The main aim of this research was to develop a model for application of risk analysis and management on publicly funded road construction contracts in Zambia. Public funded projects are projects financed through public resources, which can either be

directly from the Zambian Government or from cooperating partners, including any other financing agency whose funds are derived from the public or tax-payers.

*To attain the aim, the objectives of the research were to:*

- investigate and identify what implementation problems occur on road projects and why they occur;
- investigate and establish the prevalence or frequency of projects that fail to meet the set objectives; i.e.; cost, time and quality;
- investigate whether risk management is practiced, and what mechanisms are in place to manage and report risks; and
- investigate various projects and identify common and critical risks that occur on the projects, and subsequently develop a Risk Inventory (RI) specifically for the Zambian situation, to be utilised on future risk management activities.

#### **1.4 Research delineation**

The research mainly looked at road projects whose value is above ZMK 10 billion (approximately USD 3.0 million). Most projects of this magnitude involve surfacing using asphalt concrete or chip and spray. These are the roads commonly referred to as “black-top” or tarred roads.

#### **1.5 Dissertation layout**

This research dissertation has seven (7) chapters, which are described below.

Chapter 1 outlines the background to the road construction and maintenance programmes in Zambia. It also outlines the problems encountered on various road projects during implementation and provides a general overview of the problem under review. Aspects of risks and risk management on road projects, and how this affects the performance of road projects in Zambia are also highlighted.

Further, it sets out the aims and objectives of the research study, outlining the specifics that the study hoped to achieve.

Chapter 2 provides for a review of the various general literature available regarding risk management. It also focuses the Zambian road sector and sought to identify any

available literature on the subject of risk management. Further, available information on road project implementation in the Zambian set up was examined.

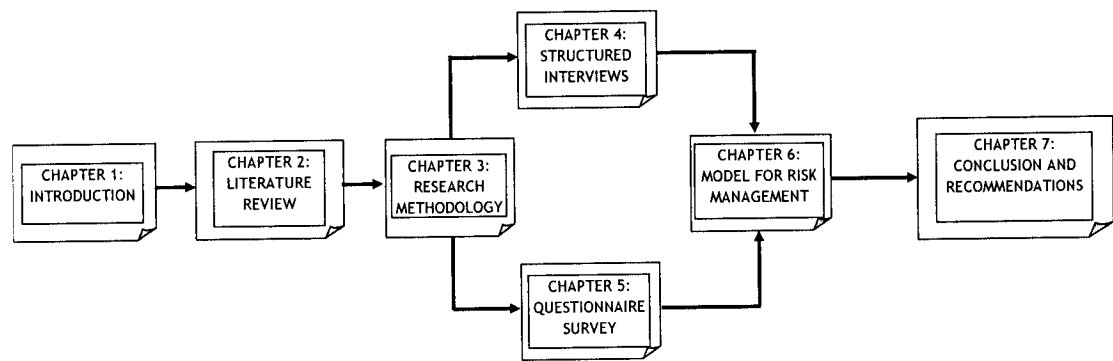
Chapter 3 gives the research methodology, indicating the methods and approaches that are used in research to collect necessary data on a particular topic. The general research approaches available and their application were outlined. Finally, the chapter provided for the research design and methodology specific to this study.

Chapters 4 and 5 give information on the two main research instruments, i.e., the structured interviews and the questionnaire surveys was presented and analysed. This chapter thus outlined the findings of the research and their interpretation.

Chapter 6 elaborates the development of a risk management model for application on Zambian road projects based on information gathered from the research surveys. Information gathered was used to identify the pitfalls and to develop the model that could address risk management activities on road projects. Before finalisation, the model was validated via a questionnaire survey by selected road sector stakeholders.

Chapter 7 focuses on the conclusions and recommendations of the research findings and their implications. It was found necessary to identify to whom the research would be useful, and this was discussed in this chapter. Finally, the chapter contains a proposal for further work on the research study topic.

For ease of reference, the flow of these chapters is summarised in figure 1.2.



**Figure 1.2:** Summary of chapters

## CHAPTER 2: LITERATURE REVIEW

### 2.0 Introduction

The preceding chapter highlighted the problems encountered on projects and identified the presence of various risks. It further linked the failure of a significant number of projects to attain the objectives to poor risk management. This chapter goes a step further to examine various literature available on project risk management.

Project risk can be defined in a variety of ways, depending on the discipline under which it is being considered. Thus, there is no single or generic definition that fits all situations. According to Hall et al. (2002), a fairly common definition of risk is “an uncertain event or condition that, if it occurs, has a positive or negative effect on a project’s objectives.” Similarly, the California Department of Transportation (2003) defines project risk in a related manner.

There has been much debate, however, on the inclusion of ‘positive risk’ in the definition of risk. Some schools of thought view risk as that which has a negative impact on a project’s objectives.

Three characteristics commonly found in all definitions of risk are (Hall et al., 2002):

- a risk is a future event that may or may not occur. Sometimes past events are categorised as causing or being problems, issues, or maybe a crisis. Since these events were in the past, they are not examples of risk. In addition to taking place in the future, a risk must also be an event. Therefore, terms like cost, schedule and performance do not meet the definition of risk because they are not events. However, a future event in the program schedule or a future event that measures system performance could be a risk. Also, neither a person nor a place is an event, so neither meets the definition of risk. However, an event that a person executes or an event that occurs at a particular place could be a risk.
- the probability of the future event occurring must be greater than 0% but less than 100%. There are countless future events – but not all of them are risks. Future events that have a 0 or 100 % chance of occurrence are not risks. Once we know with 100% certainty that a future event will occur, we have a problem,

a crisis or an issue, not a risk. Thus, future events are risk candidates if their probability of occurrence lies between 0% and 100%; and

- the consequence of the future event must be unexpected or unplanned for. There are many future events that could possibly occur (with a probability between zero and 100 percent), with unexpected consequences. Once an event is determined to be in the future and has a probability of occurrence between 0% and 100%, its probable consequence needs to be determined.

Ben-david et al. (2001) define risk as “the exposure to the probability that an event with adverse consequences might occur”. Reiss (2001) states that risk refers to “a possible loss or other adverse event .....”. Mccallum (2000), Warszawski et al. (2004), Chege L. et al. (2002) all define risk as having an adverse or negative impact and having an element of loss.

Galway (2004) clearly defines risk as “an event which is uncertain and has a negative impact on some endeavour”.

This position is supported by the Association for Project Management (2000) which states that all uncertainty produces an exposure to risk, which in project management terms, may cause a failure to:

- keep within budget;
- achieve the required completion date; and
- achieve the required performance objective.

The METHOD 123 Ltd (2003) also defines risk as “any event which is likely to adversely affect the ability of the project to achieve the defined objectives.” Perhaps one of the most interesting definitions of risk comes from Jannadi et al. (2003) who state that the word “risk” is believed to be a sailor’s term that came from the Spanish and meant “to run into danger or to go against a rock”. Clearly, risk cannot have a positive effect. A more recent definition of risk is found in a paper by Sato et al. (2005): “a factor of change causing a social loss as a result of impeding the achievement of a goal”. Clearly, risks are those factors that threaten the attainment of the three project constraints of schedule, budget and performance standard. In project management terms, risks are those factors that may cause a failure to meet the



project's objectives (Association for Project Management, 2000). For the purposes of this study, the working definition of risk is "any future event or condition that, if not well planned for or managed, will have an adverse effect on the successful completion of a project". In this text, risk is viewed as having a negative impact on a project; positive impact thus does not constitute risk.

## **2.1 The risk management process**

Risks identified on a project have to be assessed to ascertain their nature, impact and likelihood of occurrence. Subsequently, to ensure success of a project, these risks need to be properly managed should they occur.

The METHOD 123 Ltd (2003) defines the risk management process as a method by which risks to a project (e.g. to scope, deliverables, timescales or resources) are formally identified, quantified and managed prior to and during execution. The risk management process is undertaken to ensure that each risk identified within the project environment is documented and mitigated as appropriate. The process entails completing a number of actions to reduce the likelihood of occurrence and the severity of impact of each risk.

The Association for Project Management (2000) defines project risk analysis and management as a process which enables the analysis and management of the risks associated with a project, which when properly undertaken will increase the likelihood of successful completion of a project to cost, time and performance objectives.

The California Department of Transportation (2003) elaborates by stating that risk management is the systematic process of planning for, identifying, analysing, responding to, and monitoring project risk. It involves processes, tools, and techniques that help the project manager maximise the probability and consequences of positive events and minimise the probability and consequences of adverse events. Project risk management is most effective when performed early in the life of the project and is a continuing responsibility throughout the project. Although this process is usually undertaken during the execution or implementation phase of the project (i.e. the phase within which the physical works are undertaken), according to

Thompson et al. (1992) risk management should be applied throughout the phases of the life of a project which include:

- feasibility study;
- design;
- bidding process; and
- implementation.

In theory, any risk identified during the life of the project will need to be formally managed as part of the risk management process. Without a formal risk management process in place, the objective of delivering a project within ‘time, cost and quality’ may be compromised. The risk management process is terminated only when the execution phase of the project is completed, i.e. prior to project closure. The matrix in Table 2.1 shows the two main process tasks, the four sub-tasks, and all of the deliverables associated with project risk management (Project Risk Management Handbook, 2003).

**Table 2.1:** Process tasks in risk management

Process tasks		Task outputs or deliverables)
Risk management planning		Risk management plan
	Risk identification	Project risk list
	Qualitative risk analysis	Prioritised list of risks classified as high, moderate, or low.
	Quantitative risk analysis (performed only if a more rigorous, more advanced analysis is required)	An analysis of the project’s likelihood of achieving its cost, time and scope objectives
	Risk response planning	Risk response plan, including one or more of the following: residual risks, secondary risks, change control, contingency reserve (amounts of time or budget needed), and inputs to a revised project plan
Risk monitoring and control		Work-around plans, corrective actions, project change requests, and updates to the risk response plan and to risk identification checklists for future projects

### 2.1.1 Project phases and risk

It is widely accepted that for a project to be successful, risk management ought to be applied throughout the project cycle, i.e., from planning to implementation.

From available literature on the Zambian road sector, most projects face the greatest hurdles or risks during:

- design: as a result of incomplete or poor design;
- sanctioning: allowing a project to go ahead without sound financial backing;
- tendering: selecting a tender purely on lowest price basis or awarding to an incompetent bidder who in turn fails to perform;
- contract model or planning: improper or failure to clearly allocate risks in a contract; and
- implementation: failure to properly execute a project for various reasons.

The Association for Project Management (2000) identifies five points in a project where application of risk management can be particularly beneficial:

- feasibility study - at this stage the project is most flexible enabling changes to be made which can reduce the risks at a relatively low cost. It can also help in deciding between various implementation options for the project;
- sanction - the client can make use of risk management to view the risk exposure associated with the project and can check that all possible steps to reduce or manage the risks have been taken. If a quantitative analysis has been carried out then the client will be able to understand the chance of achieving the project objectives of cost, time and performance;
- tendering - the contractor can make use of risk management to ensure that all risks have been identified and to help set risk contingency or check risk exposure;
- post tender - the client can make use of risk management to ensure that all risks have been identified by the contractor and to assess the likelihood of construction schedules being achieved; and
- at intervals during implementation - it can help to improve the likelihood of completing the project to cost and timescale if all risks are identified and are correctly managed as they occur.

#### **2.1.1.1 Risk in project appraisal**

Thompson et al. (1992) highlight the following project phases and the importance of consistent risk management. Risk management is most valuable early in a project proposal, while there is still the flexibility in design and planning to consider how

the serious risks may be avoided. Not all risks can be avoided, but their impact can be extenuated. Risk management should, therefore be continued throughout the life of a project. It should influence each stage of commitment by the client, especially the following three stages:

- in deciding the project 'master plan' or brief resulting from the evaluation of various schemes in the project appraisal stage;
- in preparing the final proposal for sanction; and
- in deciding the contract strategy and basis for awarding contracts.

As pointed out earlier, the greatest uncertainty is encountered early in the life of a new project. Consequently, decisions taken during the early stages of a project can have a very large impact on the final cost and duration. Change is an unavoidable feature of many projects, but the likely extent and effects are frequently underestimated during the early phases.

Applying risk management at the project appraisal stage will give the client a much clearer idea of the project, and will enable decisions to be made with far more confidence.

Risks can affect the estimates of project cost and the predictions of cash flows needed in project appraisal to make decisions between alternative schemes, test their economic justification and assess the financing needed. The analysis of the risks should:

- provide the basis for setting realistic contingencies and estimating tolerances consistent with the objective of preparing the best estimate of anticipated total project cost; and
- indicate comparative differences of how risky alternative project schemes may be.

#### **2.1.1.2 Risk in funding decisions**

The stage, commonly known as 'sanction' by clients, is of critical importance in the life of a project, as it leads to the major expenditure on design, procurement, and construction.

Traditionally, a sanction proposal includes a cost estimate, project programme, and technical specification. The cost estimate and programme should allow for risk. There should also be an extra component in the proposal - namely a plan for risk management which will concentrate on contract strategy but may include other proposals such as insurance. The choice of contract strategy should be based on consideration of the responsibilities for the risks of design, construction and services, their interfaces, the division of work packages, the number and type of contracts, and methods of selecting the contractor.

#### **2.1.1.3 Risk in contracts**

Risk cannot be eliminated through the drafting and placing of contracts, but the strategy chosen or assumed for dealing with risk in contracts can greatly influence how risks are managed. The contractual arrangements and terms have a significant influence on the risk carried by each party and on the clarity with which they are perceived, and therefore on the cost, quality and duration of the project.

It is vital that all risks are allocated in a contract. Risks can be categorised by the level of transfer from the client to the contractor. Risks can either be transferred to the contractor at a price or retained by the client. The main decisions where the client can gain from risk management are:

- in formulating contract terms, particularly in choosing an equitable risk allocation;
- in assessing the opportunities for risk management made possible by different types of contractual arrangements; and
- in choosing terms (conditions) of contract which define the risks and their allocation and provide incentives for the efficient management of risks as they occur during construction.

Before tenders are invited the client or his advisers should prepare an up-to-date estimate of the expected tender price based on the information contained in the tender documents. This should be used to:

- assess the consequences of risk allocation;
- check the adequacy of the information in the documents;
- provide a criterion for assessing contractors' tenders, particularly in judging how

- risks will affect the relationship between final contract price and tender amount, and between final completion date and the tendered programme; and
- strengthen the client's position in contract negotiation and in subsequent contract management.

#### **2.1.1.4 Risk during bidding**

Risk management is essential during the bidding process. The bidder must identify, assess and develop a mitigation plan for risks so identified during this project phase. In this way, the bid or proposal will be more comprehensive and accurate in terms of price and schedule.

Leopoulos et al. (2003) conducted a study whose objective was to show that construction companies that participate in competitive bids should consider risk as an integrative parameter of all the factors that interfere in their estimations and direct their bidding effort, accordingly. They proposed a method that integrates risk management into the bidding process. They noted that identification and assessment of risks during the early phase of the project (i.e., the bidding phase) resulted in more accurate estimations and gave the opportunity of their integration, later, into the contract.

In order to assess the loss caused by unmanaged risks, Leopoulos et al. (2003) analysed data from twenty (20) similar projects of a major member of the Greek construction industry.

Comparing the results revealed that the actual duration and cost of the projects was more than the planned, and that the actual performance was below the planned performance. These differences were caused by a disregard of risks brought about by incomplete study, legal problems and changes in the scope of work during the bidding process. Some of these risks had actually been known by the firms during the bidding phase (Leopoulos et al., 2003). The incomplete study caused problems that could only be faced after award of the contract during the execution of the project. The second type of risk concerned legal problems, such as permission from the state for the work to be carried out, etc. The last risk, which was frequently met, was changes requested by the client during execution of the project.



## **2.2 Benefits of project risk management**

It is evident from available information on the Zambian road sector that risk management is yet to be fully appreciated in the Zambian Road Sector in particular, and the construction industry in general. According to the Association for Project Managers (2000), some of the main benefits of effective project risk management are:

- an increased understanding of the project, which in turn leads to the formulation of more realistic plans, in terms of both cost estimates and timescales;
- an increased understanding of the risks in a project and their possible impact, which can lead to the minimisation of risks for a party and/or the allocation of risks to the party best able to handle them;
- an understanding of how risks in a project can lead to the use of a more suitable type of contract;
- an independent view of the project risks which can help to justify decisions and enable more efficient and effective management of the risks;
- a knowledge of the risks in a project which allows assessment of contingencies that actually reflect the risks and which also tends to discourage the acceptance of financially unsound projects;
- a contribution to the build-up of statistical information of historical risks that will assist in better modelling of future projects; and
- facilitation of greater, but more rational, risk taking, thus increasing the benefits that can be gained from risk taking.

The ultimate success of a project within the ever-tightening constraints of time, cost and performance depends heavily on how the project deals with the ever-present risks. Thus, a good risk management process is proactive in nature, and is fundamentally different from crisis management or problem solving, which is reactive. In addition, crisis management is a resource-intensive process that is normally constrained by a restricted set of available options. This is in part because typically, problem-solving options decrease as the time taken to discover problems increases. The adverse cost, schedule and/or performance impacts associated with those options are likely to be substantially greater than if the issues had been identified much earlier in the project. This is partly because trade-offs between the

constraints of cost, schedule and performance cannot be attained perfectly in the short-run.

### **2.3 Risk management activities**

In order to effectively manage risks on a project, the salient steps and activities have to be clearly defined and understood. The risk management process is one that involves three to five key steps that flow in a logical sequence when applied.

Different schools of thought present slightly different recognisable steps in the process. However, by and large, regardless of the steps, most ultimately refer to the same procedures, but just worded differently.

For instance, Choi et al. (2005) outlined the following major steps in risk management:

- identifying the risks;
- analysing the risks;
- evaluating the risks; and
- managing the risks.

On the other hand, METHOD 123 Ltd (2003) states that the risk management process usually involves the following critical activities:

- identification of project risks;
- logging and prioritising of project risks;
- identification of risk mitigating actions;
- assignment and monitoring of risk mitigating actions; and
- closure of project risks.

In general, the widely recognised activities are summarised as:

- identification of risks;
- assessment of risks (analysis and evaluation);
- treatment of risks;
- monitoring and review of risks; and
- communication and consultation on risks.

### **2.3.1 Risk identification**

According to Chege et al. (2002) this is the first stage in risk management and entails capturing all the potential risks that could arise within the project.

Hall et al. (2002) stated that this is the process of examining the project to determine and document risks, with their characteristics, that might affect the project. To begin any sort of risk analysis or identification process for a project, examination of the project description for any obvious sources of risk is necessary. Risks will vary with the type of project undertaken, the operation to be conducted, and the environment under which the project is being executed.

Examining the nature of a project can identify sources of risk. Risk can be associated with any aspect of a project's objectives. Risk identification can be both subjective and objective, i.e., based on expert judgment or data. A number of techniques can be used for risk identification, but brainstorming is a preferred method because of its flexibility and capability, when appropriately structured, of generating a wide and diverse range of risks.

Information used in the risk identification process may include historical data, theoretical analysis, empirical data and analysis, informed opinions of the project team and other experts, and the concerns of stakeholders. The risk identification process must be comprehensive, as risks that have not been identified cannot be assessed, and their emergence at a later time may threaten the success of the project and cause unpleasant surprises. The process should be structured using the key elements to examine risks systematically, in each area of the project to be addressed. The output is a comprehensive list of possible risks to the successful outcome of the project, usually in the form of a risk register, which allocates the management responsibility of the particular risks to risk owners.

### **2.3.2 Risk assessment**

Risk assessment is the overall process of risk analysis and risk evaluation. Its purpose is to develop agreed priorities for the identified risks.

Risk analysis is the systematic use of available information to determine how often specified events may occur and the magnitude of their consequences. Risk evaluation is the process of comparing the estimated risk against given risk criteria to determine the significance of the risk (Queensland Govt., 2004). The assessment process:

- determines the consequences of each risk, should it arise;
- assesses the likelihood of those consequences occurring;
- converts the consequence and likelihood ratings to an initial priority for the risk; and
- develops agreed risk priorities and inherent risk levels.

The agreed priorities are used to determine where the greatest effort should be focused in treating identified risks. They facilitate structured action planning and resource allocation.

This stage of the risk management process generates a prioritised list of risks and a detailed understanding of their impacts upon the success of the project should they occur. The consequence and likelihood ratings and the agreed risk priorities are all recorded in the risk register.

### **2.3.3 Risk treatment**

Risk treatment is the formulation of risk mitigating actions. The purpose of this stage is to determine what will be done in response to the risks that have been identified, in order to reduce the overall risk exposure. Unless action is taken, the risk identification and assessment process may be a futility. Risk treatment converts the earlier analyses into substantive actions to reduce risks. The primary inputs to this step are the lists of risks and their agreed priorities from the previous step and the current project plans and budgets (Queensland Govt., 2004).

Risk treatment involves:

- identifying the options for reducing the likelihood or consequences of each Extreme, High or Medium risk;
- determining the potential benefits and costs of the options;
- selecting the best options for the project; and

- developing and implementing detailed Risk Action Plans (RAP).

Risk Action Plan (RAP) summaries are usually required for each risk classified as Extreme or High on the agreed risk priority scale. Risk response planning focuses on the high-risk items evaluated in the qualitative and/or quantitative risk analysis. It identifies and assigns parties to take responsibility for each risk response. This process ensures that each risk requiring a response has an owner. The project manager and team identify which strategy is best for each risk, and then design specific actions to implement that strategy. These strategies and actions include:

- avoidance: the team changes the project plan to eliminate the risk or to protect the project objectives from its impact. The team might achieve this by changing scope, adding time, or adding resources (thus relaxing the so-called “triple constraint”);
- transference: the team transfers the financial impact of risk by contracting out some aspect of the work. Transference reduces the risk only if the contractor is more capable of taking steps to reduce the risk and does so;
- mitigation: the team seeks to reduce the probability or consequences of a risk event to an acceptable threshold. They accomplish this through different means that are specific to the project and the risk. Mitigation steps, although costly and time-consuming, may still be preferable to going forward with the unmitigated risk; and
- acceptance: the project manager and the project team decide to accept certain risks. They do not change the project plan to deal with a risk, or identify any response strategy other than agreeing to address the risk if and when it occurs.

#### **2.3.4 Risk monitoring and review**

This stage involves the assignment and monitoring of risk mitigating actions. Continuous monitoring and review of risks ensures new risks are detected and managed, and that action plans are implemented and progressed effectively. Review processes are often implemented as part of the regular management meeting cycle, supplemented by major reviews at significant project phases and milestones. Monitoring and review activities link risk management to other management processes. They also facilitate better risk management and continuous improvement.

The main input to this step is the risk watch list of the major risks that have been identified for risk treatment action. The outcomes are in the form of revisions to the risk register, and a list of new action items for risk treatment (Queensland Govt., 2004).

### **2.3.5 Communication and consultation**

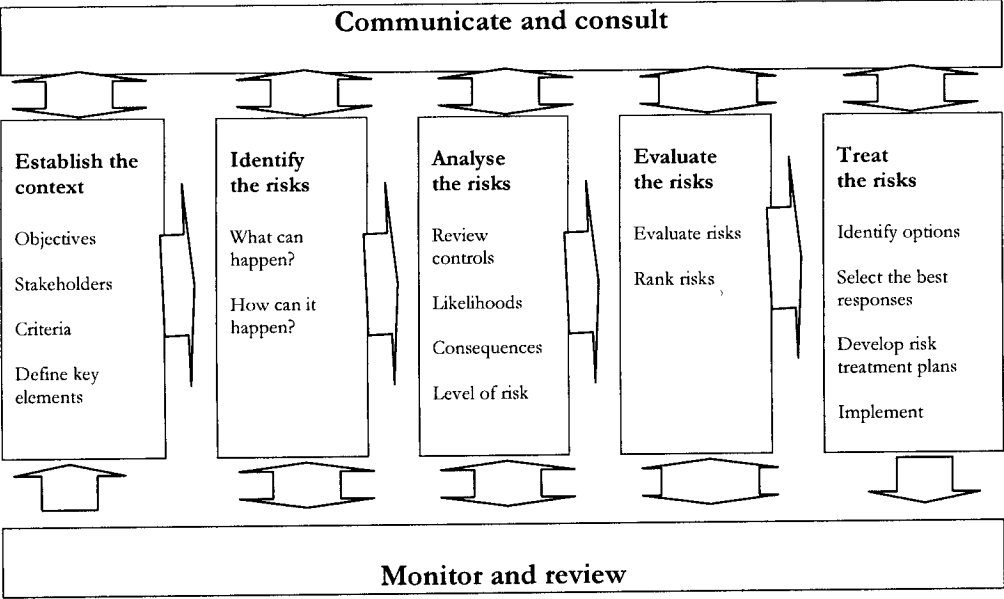
Communication and consultation with project stakeholders may be a critical factor in undertaking good risk management and achieving project outcomes that are broadly accepted. It helps project managers and financiers understand the risks and trade-offs that must be made on a particular project. This ensures all parties are fully informed, and thus avoids unpleasant surprises. Within the project management team, they help maintain the consistency and ‘reasonableness’ of risk assessments and their underlying assumptions.

In practice, regular reporting is an important component of communication. Project managers are expected to report on the current status of risks and risk management to stakeholders and the entire project management team. The risk register and the supporting action plans provide the basis for most risk reporting.

Reports provide a summary of project risks, the status of treatment actions and an indication of trends in the incidence of risks. They are usually submitted on a regular basis or as required, as part of standard reporting. Major projects may require more extensive reporting on a periodic basis or at key milestones (Queensland Govt., 2004).

The entire risk management process is summarised in Figure 2.1.





**Figure 2.1:** Summary of the risk management process

**2.3.6 Summary**

This chapter looked at a range of available literature on project risk management. One major observation made from all the literature reviewed is that most of the articles looked at risk management for projects not related to roads. Very few focus particularly on risk management for road projects. It is recognised that different projects, be it for the construction of roads, buildings, dam walls, pipelines, etc., may be subjected to different risks due to their nature. This research therefore seeks to focus on the management of risks on road projects.

The foregoing notwithstanding, there are certain risks that are common or universal to all projects and ultimately impact on the projects’ objectives similarly. Table 2.2 outlines the literature pertaining to project risk reviewed in this study, clearly stating the type of project, the risk type, and effect on the project.

Table 2.3 presents the literature that was reviewed and provides details of objectives of those particular studies, risk types and the conclusions and comments, with an element of critique.

**Table 2.2:** Various project risks identified in reviewed literature

Name of Author	Title	Project	Risk Type	Effect
Y. Sato et al. (2005)	Quantitative Risk Analysis of Road Projects Based on Empirical Data in Japan	Roads	Changes in scope of work, Prolonged consultations with relevant bodies, Delays in site access, Environmental issues, accidents, natural disaster, under-funding	Prolonged construction period, Increased costs, Compromised standard of performance
2. Choi et al. (2004)	Risk Assessment Methodology for Underground Construction Projects	Underground construction project	Accidents, inclement weather, price escalation, change of regulations, political interference, delayed payments, inadequate design, inadequate site information, shoddy work	Increased costs, bankruptcy, delays, poor work quality
3. Queensland Government (2004)	Project Manager's Risk Management Guidelines	General	Project scope, funding, poor procurement methods, legislation/regulation issues, market issues, programming issues, political issues, environmental issues, natural disasters, bad weather, , poor designs, inadequate site data	Increased cost, delay to the schedule, poor performance on the works
4. Leopoulos et al. (2003)	An applicable methodology for strategic risk management during the bidding process	Building construction	Political disorder, legal issues, acts of God, changes in payment, poor design	Increased duration, increased cost, low performance
5. Hall et al (2002)	Universal risk project final report	General	Natural disasters, political instability, legal/regulatory issues, skills of labour force, currency fluctuations, scope of works, project conditions	Increased duration, increased cost, low performance
6. Chege et al. (2002)	Risk management and procurement systems – an imperative approach	General construction	Poor procurement methods and poor contract strategy	Increased duration, increased cost, increased scope and poor quality
7. Ben-david et al. (2001)	An integrated approach for risk response development in project planning	General	Imprecise design and definition of requirements, insufficient knowledge	Increased cost, increased duration
8. Association for Project Management (2000)	Project risk analysis and Management	General	Poor decision-making structures, uncertainty of technology, industrial relations, inadequate resources	Increased duration, increased cost, failure to meet performance objectives

**Table 2.3:** Content analysis of risk literature reviewed

Author	Title	Objectives	Conclusions/Comments/Critique
1. Sato et al. (2005),	Quantitative Risk Analysis of Road Projects Based on Empirical Data in Japan	Quantitative risk analysis based on real data on roads projects and risk management	Some events have a high probability of occurrence as well as strong impacts and, therefore, demand special attention when planning a road project. The possibility of efficient management by means of risk management based on the risk matrix is suggested. The paper focuses on risk in road projects and provides valuable material for research.
2. Choi et al. (2004)	Risk Assessment Methodology for Underground Construction Projects	Demonstrating the modified risk assessment procedure and the software system model with pre-processor for the risk assessment of subway construction projects by using fuzzy concepts	The study concluded that the proposed risk assessment methodology provided rational and practical solutions to the insurance companies and the contractors with its flexible and easy-to-follow procedure and tools, and robust uncertainty modeling capability. The paper focuses on underground projects such as subways and bridges, and does not focus on road projects. The paper is a good source of information on risks.
3. Queensland Government, Department of main roads (2004)	Project Manager's Management Guidelines	Guideline in the process of risk management for projects	Risk management improves the probability of the project achieving its cost, time and performance objectives. The guide provides a generalised look at management of risks and projects, with no particular focus on roads. It does, however, provide valuable information on risk management.
4. Leopoulos et al. (2003)	An applicable methodology for strategic risk management during the bidding process	Highlighting risk as a factor in bidding and thus the need to integrate risk management during bidding	Risk management should be integrated in the bidding process. The study focuses on risk management during the bidding process, and does not tackle the implementation stage. It also does not focus on road projects.
5. Hall et al. (2002)	Universal risk project final report	Development of a list and definitions of "universal risk areas" that can assist risk management in any type of project or sector	Universal Risk Area List compiled is useful in providing an organisation with a starting point in risk identification for any project being worked, operation being carried out, analysis being accomplished or system being used. The guide provides a generalised look at management of risks on projects, with no particular focus on roads. It does, however, provide valuable information on risk management.
6. Chege et al. (2002)	Risk management and procurement systems – an imperative approach	Highlighting the link between risk management and the client's choice of procurement system.	The study determined that one of the causes of poor project performance in Africa is the use of inappropriate procurement systems resulting in critical problems such as poor allocation of risk between the client and the contractor. The paper focuses on the link between risks and the choice of a procurement system, with no focus on the implementation stages of a project. It also does not focus on road projects.
7. Ben-david, et al. (2001)	An integrated approach for risk response development in project planning. Journal of the Operational Research Society	Development and application of a decision-support model for the allocation of risk reduction efforts	Risks can be modeled and treated using mathematical optimisation tools and techniques. The paper provides an insight of risk response development planning in general, and does not focus on road projects. It has proven, though, to be a good source of information on risks.
8. Association for Project Management (2000)	Project risk analysis and Management	Introduction to the project risk analysis and management process	Risk management improves the probability of the project achieving its cost, time and performance objectives. The guide provides information on general risk management, with no particular emphasis on roads. It is, nonetheless, a very good source of information regarding project risk management.

**Table 2.3 (Cont'd)**

Author	Title	Objectives	Conclusions/Comments
9. Syed et al.	Evaluation of Florida general Contractors' Risk Management Practices	Evaluation of the existing risk management practices adopted by general contractors in Florida, with a comparison to four other states.	The results revealed that risk analysis and management techniques were rarely used by the general contractors in Florida due to a lack of knowledge. Formal and training of general contractors and construction managers is recommended in Florida. This would lead to improved construction project performance. The paper provides a generalised look at management of risks on projects, with no particular focus on roads. It does, however, provide valuable information on risk management.
10. Henriod et al. (2000)	Trends in Contracting Practice for Civil Works	Highlighting the inherent risks associated with bidding documents and their management	Where risks are inherent with traditional contract forms, other alternative forms of contracts must be considered, such as management contracts. The paper focuses on the risks associated with bidding documents, with no focus on the implementation stages of a project. It also does not focus on road projects.
11. Jannadi et al. (2003)	Risk Assessment in Construction	Development of a risk assessor model (RAM) which is computerised to determine risk associated with an activity and the justification factor for a proposed remedy on a construction project	Risk management is vital for any construction project. A computer-based model was developed that provides an acceptability level for the risks and determines a quantitative justification for the proposed remedy. The paper focuses on risk assessment in general construction, with no emphasis on road projects. However, it is a good source of information on risk assessment.
12. McCallum (2000)	A Quick Primer on Construction Risks and Contracting Practices	Identification and assessment of construction risks	Taking an enlightened, proactive approach to construction risk allocation and contracting practices can produce short-term and long-term benefits for all construction project participants. The paper provides a generalised look at management of risks on projects, with no particular focus on roads. It does, however, provide valuable information on risk management.
13. Nasir et al. (2003)	Evaluating Risk in Construction – Schedule Model	Development of a model to assist in the determination of the lower and upper activity duration values for schedule risk analysis	A schedule risk model was developed that may provide decision support to project owners, consultants and other stakeholders. The paper focuses on schedule risk, with no specific reference to road projects. It is, nonetheless, a good source of information on project risks.
14. Thompson et al. (1992)	Guide to Project Risk Analysis and Assessment – Implications for Project Clients and Project Managers	A guide on the analysis and management of risks on construction projects	Risks are present on almost all construction projects and project managers need to be equipped with the techniques for managing and monitoring risks to improve the performance of projects. The guide provides information on general risk management, with no particular emphasis on roads. It is, nonetheless, a very good source of information regarding project risk management.
15. Warszawski et al. (2004)	Practical Multifactor Approach to Evaluating Risk of Investment in Engineering Projects	Calculation of inherent project risk using the multifactor method	A method for risk analysis was developed that enables owners of building projects to identify risks and manage them. The paper provides a generalised look at management of risks on projects, with no particular focus on roads. It does, however, provide valuable information on risk management.

## **CHAPTER 3: RESEARCH METHODOLOGY**

### **3.0 Introduction**

The preceding chapter discussed the various risks in projects and the methods widely used to manage them. It also identified the specific risks that projects may be subjected to and the effects of the same risks.

This chapter focuses on the strategies that were adopted in investigating and gathering information on project risks in the Zambian context for the fulfilment of the research objectives.

### **3.1 Research methodologies**

Research methodology can be defined as a structured set of activities followed in obtaining reliable research results. According to Cohen et al. (2000) the aim of research methodology is to help in the understanding of not the products of scientific inquiry but the process itself. There are a number of research methodologies or approaches that are frequently used. The choice of which approach to use depends on the matter being investigated.

Bell (1999) points out that “different styles, traditions or approaches use different methods of collecting data, but no approach prescribes nor automatically rejects any particular method”. It is widely agreed that each approach has its advantages and disadvantages and thus the approach for the research may depend on the nature of the problem and the kind of data sought.

Although there are many schools of thought with varying definitions or explanations for research methods or methodologies, Bell (1999) clearly identifies and distinguishes three factors pertaining to a research project. These are:

- research families or strategy;
- approach in designing the research project; and
- research techniques for collecting data.

Before carrying out a research, the researcher needs to consider what strategy the research will utilise, the approach to be used in designing the research project, the techniques for collecting data, and finally the methods for analysing the data collected in the research.

### **3.1.1 Research families or strategies**

#### **3.1.1.1 Qualitative research**

A qualitative approach is one in which the inquirer often makes knowledge claims based primarily on constructivist perspectives. This implies the multiple meanings of individual experiences, meanings socially and historically constructed, with an intent of developing a theory or pattern or advocacy/participatory perspectives, i.e. political, issue-oriented, collaborative, or change oriented or both (Creswell, 2003). It also uses strategies of inquiry such as narratives, phenomenologies, ethnographies, grounded theory studies, or case studies. The researcher collects open-ended, emerging data with the primary intent of developing themes from the data (Creswell, 2003).

#### **3.1.1.2 Quantitative research**

A quantitative approach is one in which the investigator primarily uses postpositivist claims for developing knowledge. This refers to cause and effect thinking, reduction to specific variables and hypotheses and questions, use of measurement and observation, and the test of theories. This approach employs strategies of inquiry such as experiments and surveys, and collects data on predetermined instruments that yield statistical data (Creswell, 2003).

#### **3.1.1.3 Mixed research**

A mixed research approach is one in which the researcher tends to base knowledge claims on pragmatic grounds, for instance, consequence-oriented, problem-centred, and pluralistic. It employs strategies of inquiry that involve collecting data either simultaneously or sequentially to best understand research problems. The data collection also involves gathering both numeric information from instruments as well as text



information from interviews so that the final database represents both qualitative and quantitative information (Creswell, 2003).

In support of the mixed research approach, Cohen et al. (2000) state that social scientists are no longer concerned with adopting one approach over the other. Instead, they are now concerned with that combination of both qualitative and quantitative approaches which makes use of the most valuable feature of each. Thus the issue is to make a decision at which point one approach should be adopted and at which the other.

#### **3.1.1.4 Desk and fieldwork research**

Brown (2001) describes desk work or office-based research as collating existing material relevant to a campaign from published information, visuals and internet sources and contacting people from a variety of fields.

Hague (2002) adds that desk research is a term that is used loosely and it generally refers to the collection of secondary data or that which has already been collected such as published reports and statistics.

Office-based research should complement and provide the necessary background information for field-based investigations, establishing contacts and Support (Brown, 2001).

Field research, on the other hand, is the act of gathering information and visual evidence directly and verifying facts and claims (Brown, 2001).

#### **3.1.2 Approaches to designing research projects**

There are a number of approaches to designing research projects. The various research approaches and their features are explained below.

### **3.1.2.1 Action research**

This is an approach that adopts an on-the-spot procedure to deal with a problem in a present situation. The situation is monitored on a continual basis so that the feedback is utilised to provide practical improvements to the overall process being investigated. The benefits are immediate rather than posterior. This approach is particularly suited to practitioner researchers who have identified a problem during the course of their work and want to improve the status quo (Bell, 1999).

Another definition of action research is that it is a form of disciplined inquiry, in which a personal attempt is made to understand, improve and reform practice. It is a process in which practitioners study problems scientifically so that they can evaluate, improve and steer decision-making and practice. In short, action research can be viewed as the bridge between research and practice (Cohen et al., 2000).

### **3.1.2.2 Case study**

Case study can be described as a holistic term for a number of research methods that have a common decision to focus on a specific problem or situation. The case study approach may involve a number of methods such as observation and interviews (Bell, 1999).

Cohen et al. (2000) state that a case study is a specific instance that is frequently designed to illustrate a more general principle; it is the study of an instance in action. Case studies can establish cause and effect, and one of their greatest strengths is that they facilitate observation of effects in real contexts, recognising that context is a powerful determinant of both causes and effects.

### **3.1.2.3 Ethnographic style**

This approach depends on observation and complete or partial integration into the society or situation being investigated. Integration enables the researcher to share the same experiences as the subjects and understand the situation better (Bell, 1999).

#### **3.1.2.4 Surveys**

The aim of a survey is to obtain information which can be analysed and patterns extracted and comparisons made. In this approach, the sample population has to be truly representative (Bell, 1999).

#### **3.1.2.5 Experimental style**

Primarily, this approach deals with measurable phenomena. It generally involves setting up a control group and an experimental group, which can allow conclusions to be drawn about cause and effect. In social research, this would usually require large numbers of participants (Bell, 1999).

#### **3.1.2.6 Narrative inquiry**

This involves the collection and development of stories, either as a form of data collection or as a means of structuring a research project. Subjects or informants speak in a story form and the researcher listens and understands, subsequently interpreting and writing the findings (Bell, 1999).

#### **3.1.2.7 Historical research**

According to Cohen et al. (2000), this is the systematic and objective location, evaluation and synthesis of evidence in order to establish facts and draw conclusions about past events. It is an act of reconstruction undertaken in a spirit of critical inquiry designed to achieve a faithful representation of a previous age. This information comes from documents, records, personal experiences and observations of others.

#### **3.1.2.8 Ex post facto research**

This literally translated means “from what is done afterwards” or in the context of social and educational research “after the fact” or “retrospectively”. It refers to those studies which investigate possible cause-and-effect relationships by observing an existing condition or state of affairs and searching back in time for plausible causal factors. Ex post facto is a method of teasing out possible antecedents of events that happened and cannot therefore be manipulated by the investigator (Cohen et al., 2000).

### **3.1.2.9 Experiments, quasi-experiments and single-case research**

The essential feature of experimental research is that the investigators deliberately control and manipulate the conditions which determine the events in which they are interested. In simple terms, it involves making a change in the value of one variable – called the independent variable – and observing the effect of that change on another variable – the dependent variable (Cohen et al., 2000).

### **3.1.3 Techniques for data collection**

Also referred to as research methods, there are a number of methods or techniques for gathering data in a research project.

Some scholars have attempted to draw a distinction between research methodology and research methods, as the terms are sometimes erroneously thought to be interchangeable. Cohen et al. (2000) state that “research methods” refers to that range of approaches used in educational research to gather data which are to be used as a basis for inference and interpretation, for explanation and prediction. Basically methods refer to techniques and procedures used in the process of gathering data.

Bryman (2001) agrees with this statement and defines research method as “a technique for collecting data. It can involve a specific instrument such as a self-completion questionnaire or a structured interview schedule, or participant observation whereby the researcher listens to and watches others”.

As explained earlier, research methodology refers to a structured set of activities followed in obtaining reliable research results.

There are various methods available for collecting data, and each method or a combination may be suitable for a particular situation. However, no one method is superior to the other or is universally appropriate. Below are some methods (Bell, 1999):

- documents;
- interviews;

- observation; and
- questionnaires.

### **3.1.4 Triangulation**

The term triangulation is borrowed from surveying or navigation, where it refers to the practice of establishing the exact position of an object by taking measurements or readings from multiple viewpoints. Using more than one reference point enables greater accuracy of measurement (Clark, 1999).

Applying this logic to social research, four different types of triangulation are identified:

- data;
- investigator;
- theory; and
- methodological.

Data triangulation involves the creation of multiple data sets by collecting data in a variety of contexts and settings at different points in time. This may involve using the same method on more than one occasion or using different methods at different times (Clark, 1999).

Investigator triangulation occurs when more than one researcher or evaluator investigates the same situation. Using multiple investigators ensures that a number of different view points are represented. The approach adopted by individual evaluators is largely influenced by their disciplinary roots, theoretical orientations and methodological preferences. In some contexts evaluators may require specialist knowledge in substantive areas in addition to their technical expertise in evaluation methodology. Where this is the case, there are advantages to be gained from working together in multi-disciplinary evaluation teams (Clark, 1999).

The theory triangulation entails making use of a number of alternative or competing theories in examining the data (Clark, 1999).

Methodological triangulation is in two broad types: within method and the between methods or across methods approaches (Clark, 1999).

Within-methods entails applying the same method on different occasions or using multiple techniques within a given method. Examples include administering the same questionnaire to respondents on separate occasions or attempting to address the same phenomena using a mixture of different scaling techniques, attitudinal measures and open-ended questions. In contrast, between-methods triangulation refers to the actual mixing of methods in a single research design. For example, a questionnaire survey of programme participants can be combined with non-participant observation of programme activities and qualitative interviews with samples of recipients and key workers (Clark, 1999).

One advantage gained from using triangulation as part of a multi-method research design is that it allows the researcher to have greater confidence in the research findings than is the case when a single method is used. Given that each research has its own strengths and weaknesses, advocates of triangulation maintain that, as the strengths of one method can be expected to compensate for the weaknesses of another, the overall quality of the research data will be improved by using more than one method (Clark, 1999).

According to this view, employing multiple methods effectively reduces measurement error and helps to overcome problems of bias. Furthermore, methodological triangulation is presented as a way of guarding against threats to both reliability and validity. Within-method triangulation essentially involves cross-checking for internal consistency or reliability while between-method triangulation tests the degree of external validity (Clark, 1999).

Table 3.1 offers an overview of the purpose, advantages and disadvantages of some of the methods.

**Table 3.1:**     Research methods and features

Method	Overall Purpose	Advantages	Challenges
Questionnaires, surveys	Quick and easy way to obtain information from people in a non-threatening way	<ul style="list-style-type: none"><li>• can be completed anonymously</li><li>• inexpensive to administer</li><li>• easy to compare and analyse</li><li>• can be administered to many respondents</li><li>• provides a lot of data</li><li>• many sample questionnaires already exist</li></ul>	<ul style="list-style-type: none"><li>• Feedback may not be diligent</li><li>• may be leading due to wording</li><li>• are impersonal</li></ul>
Interviews	Opportunity to fully understand interviewees' impressions or experiences	<ul style="list-style-type: none"><li>• Allows obtaining of full range and depth of information</li><li>• facilitates the development of a relationship with interviewees</li></ul>	<ul style="list-style-type: none"><li>• Time consuming</li><li>• difficulty in analysing and comparing</li><li>• may be costly</li><li>• Interviewer can bias interviewee's responses</li></ul>
Documentation review	Opportunity to understand the operation of a program without interrupting the program. Information can be gathered from documents	<ul style="list-style-type: none"><li>• Provides comprehensive and historical information</li><li>• no interruption to the program or respondents' routine in the program</li><li>• information already exists</li><li>• few biases about information</li></ul>	<ul style="list-style-type: none"><li>• Time consuming</li><li>• information may be incomplete</li><li>• not flexible means in obtaining data</li><li>• data restricted to what already exists</li></ul>
Observation	Gathering of accurate information on the operation of a program and processes	<ul style="list-style-type: none"><li>• Allows first-hand observation of operations</li><li>• flexibility in adaptation to events as they occur</li></ul>	<ul style="list-style-type: none"><li>• Interpretation of observed behaviours may be difficult</li><li>• may be difficult to categorise observations</li><li>• potential to influence behaviors of program participants</li><li>• can be expensive</li></ul>



## **3.2 Research design and methodology**

After looking at a number of strategies, approaches and techniques for tackling a research problem in Section 3.1, this section presents the specific methods used in this research.

Research design provides a framework for the collection and analysis of data. A choice of research design reflects decisions about the priority being given to a range of dimensions of the research process (Cohen et al., 2000).

Decisions on the research design and methodology establish the practicalities of the research. Decisions here include (Cohen et al., 2000):

- what the specific purposes of the research are;
- how the general research purposes and aims will be operationalised into specific research questions;
- what the specific research questions are;
- what the focus of the research will be in order to answer the research questions;
- what the main methodology of the research is. For instance, quantitative survey, qualitative research, ethnographic study, experiment, case study or action research;
- the kinds of data that are required;
- from whom the data will be required, i.e. sampling;
- other sources of data, e.g. documentary sources;
- how data will be gathered, i.e. instrumentation; and
- how the data will be analysed.

### **3.2.1 Selection of research methodology**

Generally, there are three considerations to be made in selecting the research methodology (Creswell, 2003):

- the research problem – certain types of social research problems call for specific approaches;

- the personal experiences of the researcher – the researcher's own personal experiences and training come into play and one is bound to select an approach that they are familiar with; and
- the audience(s) for whom the report will be written – the researcher must be sensitive to the type of audience for whom the research is intended.

Due to the inherent advantages of using a mixed research strategy, both qualitative and quantitative methods were used in this research. Creswell (2003) points out the important fact that most researchers seem to increasingly favour the mixed method approach, i.e. both qualitative and quantitative.

Thus, this research employed both qualitative and quantitative strategies. Further, field work and desk work approaches were also used in addressing the research problem.

In order to investigate the research problem, the study of a specific project or projects was necessary. This involved reviewing of relevant and available information or documentation on the projects. Thus, this required focussing on a specific problem or situation to facilitate observation and collection of the necessary data. This implied the use of historical or documentation review on case studies.

A lot of information can be gathered through the study of documentation of a past project or through physical observation of actual work carried out on that particular project. Any evident problems were identified and efforts made to determine their causes. This also implied the use of ex post facto research approach.

### **3.2.2 Instruments for collecting data in the research**

The decision on which instrument to use frequently follows from an important earlier decision on which kind of research to undertake (Cohen et al., 2000). The following research approaches were selected for this particular research:

- case study research;
- Historical research; and

- ex post facto research.

The instruments used for collecting data in this research were:

- interviews;
- questionnaires;
- observation; and
- documentation review.

Data and methodological triangulation were also used to ensure increased reliability, internal consistency and external validity of research findings.

Table 3.2 summarises the design and methodology adopted for this research.

**Table 3.2:** Summary of research design and methodology

Research Strategy	Research Approach	Data Collection Techniques	Triangulation
Qualitative, quantitative Desk and field work	Case study Historical research Ex post facto	Interviews Observation Questionnaires Documentation review	Data Methodological

### 3.3 Case study design

Case studies involved the reviewing of project documentation and any other available relevant data needed to provide information for the research problem. Thorough review of available documentation for selected projects was undertaken. Some of the projects reviewed were:

- construction of the Mongu-Kalabo Road;
- rehabilitation of the Mpika – Kasama Road;
- rehabilitation of the Mpika – Chinsali Road;
- rehabilitation of the Chinsali – Nakonde Road;
- rehabilitation of the Monze – Zimba Road;
- rehabilitation of the Luanshya – Mpongwe Road;

- reconstruction of the Kasama – Luwingu Road; and
- reconstruction of the Kashikishi – Lunchinda Road.

### **3.3.1 Desk research**

A detailed analysis of past, on-going and future road projects was undertaken to determine the extent to which risk management is applied and its results. This included the review of all project documentation and any other available official information ranging from feasibility study, design, tendering and implementation stages of the projects. Project documentation reviewed included progress reports, correspondence and minutes of site meetings to identify the various risk-related problems, what impact they had on projects and how they were dealt with. Additionally, the study sought to split the projects into the various stages and identified the various risks related to each stage.

Project documentation was analysed to determine any deviations from original objectives of cost, schedule and quality and reasons thereof. This information was obtained from monthly payment certificates, completion certificates and projects progress reports, among others. The specific information extracted included:

- original and final project cost;
- original and final project schedule;
- original and final project scope of works; and
- any impediments that the project may have faced.

Most of this information was obtained from the Road Development Agency (RDA), National Road Fund Agency (NRFA) and the Ministry of Local Government and Housing (MLGH). Subsequently, a detailed list of risks that could have possibly contributed to the project’s failure to meet its original objectives was developed. The risks were further broken down into constituent elements of factor, event and impact.

Sato et al. (2005) clarify the causal relationship of risks by stating that a risk consists of three elements, i.e. “factor”, “event” and “impact”. They defined each of these as follows:

- factors are phenomena which are potential causes of impeding the achievement of a goal. Concrete examples are economic changes, natural disasters and changes of the traffic volume, etc.;
- events originate from factors and are the direct causes that, with a certain probability, impede or prevent the achievement of a goal. Concrete examples are difficulties in land acquisition negotiations, increased volume of rehabilitation work and increased maintenance work.; and
- impact is the direct result of an event(s) occurring. Concrete examples are prolongation of the project period and increase of the project cost.

Once the risks had been identified, their effects were studied so that a clear picture emerged of what impact each identified risk had on the project.

### **3.3.2 Field survey research**

Field surveys consisted of questionnaires and semi-structured Interviews with officials from various Government institutions and other key players in the Zambian Road Sector. These tools sought to gather data that would provide an overview of the extent and practice of risk management on publicly funded projects.

This information was analysed and summarised to provide a general picture of the risk management practices in Zambia. Flowing from this was a set of recommendations on how projects can be better managed.

### **3.3.3 Field observations**

The field visits or physical inspections were conducted mainly to confirm what work was actually done compared to the planned, and the standard of performance. The visits also helped to identify from the existing works any problems faced in implementation and to track the progress of those that were still being implemented, with a view to identifying potential risks.

Information gathered on the ground was used to substantiate the impact of poor risk management on the actual implementation of the projects.

### **3.3.4 Data analysis**

The researcher needed to consider the mode of data analysis because it has a specific bearing on the form of instrumentation. In planning data analysis, the following was considered (Cohen et al., 2000):

- what needs to be done with the data when it has been collected – how will it be processed and analysed?; and
- how will the results of the analysis be verified, cross-checked and validated?

The data collected was evaluated using both qualitative and quantitative methods.

#### **3.3.4.1 Qualitative analysis**

Qualitative analysis focuses on the subjective assessment of risks and allows the main risk sources or factors to be identified. This can be done, for example, with the aid of check lists, interviews or brainstorming sessions. This is usually associated with some form of assessment which could be the description of each risk and its impacts or a subjective labelling of each risk, e.g. high or low in terms of both its impact and its probability of occurrence.

The aim was to identify the key risks, perhaps between five and ten, for each project or part-project on large projects which were then analysed and managed in more detail (Association for Project Managers, 2000). In this study, listed risks were assessed to establish their probability of occurrence and magnitude of impact. This formed a basis for their ranking in a risk-ranking matrix; one for impact of risk on project cost, the second for impact of risk on project duration, and the third on impact of risk on the quality of work. The risk-ranking matrix showed the relative importance of each risk in terms of probability of occurrence and its impact on a project. The ranking process was based on expert judgement, experience and historical data.

The analysis revealed the varying practices, experiences, attitudes and beliefs from the many respondents who participated in the survey. The result of this analysis should bring about an increased understanding on the various risks that are present in the industry, how they are ranked and dealt with. An initial qualitative analysis is essential. It brings considerable benefit in terms of understanding the project and its problems irrespective of whether or not a quantitative analysis is carried out. It may also serve to highlight possibilities for risk 'closure' i.e. the development of a specific plan to deal with specific risk issues (Association for Project Managers, 2000).

#### **3.3.4.2 Quantitative analysis**

Quantitative analysis often involves more sophisticated techniques, usually requiring computer software. This is the most formal aspect of the whole process requiring:

- measurement of uncertainty in cost and time estimates; and
- probabilistic combination of individual uncertainties.

Such techniques can be applied with varying levels of effort ranging from modest to extensively thorough. The main techniques currently in use are:

- sensitivity analysis;
- probabilistic analysis – Analytic Hierarchy Process, Monte Carlo Simulation or Controlled Interval Memory Method;
- influence diagrams; and
- decision trees.

Quantitative analysis focuses on an objective assessment of the risks, i.e., gathering of information and evaluation using numerical methods. The quantifiable data may be gathered from various sources via a questionnaire survey, or other suitable method, and analysed. This data indicates the effect of risks on the cost of works, period of completion and standard of performance.

Depending on the reliability and abundance of the data obtained in the study, the Monte Carlo Simulation technique or the Expert Choice Programme based on the Analytic Hierarchy Process can be used in the analysis of the data.

The quantitative analysis of risks can only be meaningful in the midst of adequate information on risks. It is difficult to perform such an exercise if the data collected is limited or not reliable. It is therefore advisable that reliable and abundant risk data be obtained in any research so that the quantitative risk analysis process can prove meaningful and representative of the situation.

This research concentrated on the use of the Probabilistic Quantitative Analysis using the Expert Choice software that is based on the Analytic Hierarchy Process and the Monte Carlo Simulation technique.

### **3.4 Summary**

Three methods were used to collect relevant information in this study. These were:

- structured interviews;
- questionnaire survey; and
- observations and documentation review.

The information collected was analysed and discussed, and the findings are presented in the next chapter.



## **CHAPTER 4:           STRUCTURED INTERVIEWS ANALYSIS AND DISCUSSION OF RESULTS**

### **4.0     Introduction**

The previous chapter discussed the various methods that may be utilised in investigating a research problem. It also looked at the specific methods adopted in investigating and obtaining valuable information for this research on risk management practices in the Zambian road sector. These approaches are structured interviews, questionnaire surveys and a case study. This chapter focuses on the analysis and discussion of the data gathered from the methods employed in the research.

### **4.1     Analysis and discussion of results for structured interviews**

Structured interviews were conducted with key officials and professionals operating in engineering consulting firms, road contractors, funding agencies and implementing agencies in the Zambian Road Sector. A list of consultants and contractors was obtained from the Association of Consulting Engineers of Zambia (ACEZ) and NCC, respectively. Potential interviewees were contacted by phone or in person to confirm their willingness to participate in the interviews. Contents of the interview were explained well in advance or just prior to the scheduled interview to prepare the interviewees. These interviews were conducted over a period of three (3) months from October 2006 to December 2006.

The overall purpose of the structured interviews was to provide an opportunity to fully understand interviewees' impressions or experiences regarding risk management on road projects. The interviews sought to identify the practices, beliefs and the extent of risk management in Zambia. The interviews were only exploratory and sought to give a brief insight into the research subject; hence the small sample size.

The advantage of an interview is its ability to allow for obtaining of the full range and depth of information from interviewees. An interview also facilitates the development of a relationship with interviewees, with the benefit that they will be as honest as possible

in their responses. Interviews also provide a real time interface and feedback opportunity, such that any 'grey' areas can be clarified immediately. The success rate of interviews is also high; once an interview is fixed, it will most certainly be conducted. However, interviews also have their downside; more often interviews can be involving and time consuming. It is not always easy to get interviewees to commit their time. Data from interviews can sometimes be difficult to analyse and compare, especially because interviewees can give varying responses with no common basis for comparison. Lastly, interviewees can have the disadvantage that the interviewer can lead the interviewee and thus prejudice the responses.

The structured interviews were carried out as a prelude to the questionnaire survey. The interviews were divided in four (4) sections: Section A: General information on interviewee and firm; Section B: Brief overview of projects; Section C: Existing risk management practices; and Section D: Risk management process.

The data collected was evaluated using both qualitative and quantitative methods. The interviews were intended to bring out the initial or preliminary challenges that financiers, consultants, implementing agencies and contractors face in implementing road projects in the Zambian set up. Once some of these challenges were highlighted, they formed part of the information utilised in the construction of the wider survey involving questionnaire distribution. Additionally, the interview results were cross-checked with the results from the questionnaire survey to provide validation.

A copy of the interview questionnaire is attached in Appendix A.

#### **4.1.1 General information on interviewees and firms**

Since the interviews were exploratory, fifteen (15) officials, five (5) from each category, i.e., contractors (5), consultants (5) and implementing agencies/funding agencies (5) were randomly selected. Ten (10) out of the fifteen (15) officials were eventually interviewed. This sample size, though small, encompassed all the key players in the

Zambian Road Sector and provided an indicative feedback on the situation that obtained at the time.

The sample distribution was as shown in Figure 4.1.

Implementing agency		4
Consulting firms		4
Construction firms		1
Funding agencies		1

**Figure 4.1:** Type of organisations that participated in the interview

In Section A, the interviewees were asked the name of their organisation, the type of organisation they worked for, their position in the organisation and the span of experience they had in the road sector.

Seven (7) interviewees were in senior management positions, while three (3) were in middle management positions as shown in Figure 4.2.

Senior management		7
Middle management		3

**Figure 4.2:** Positions of interviewees in their organisations

The span of experience for the interviewees ranged from 7 to 15 years. This rich experience provided the confidence that the people being interviewed had enough exposure in the road sector and would thus provide reliable information.

One immediately notable fact was the limited number of consultancy and local large construction firms in the road sector. Of course implementing and funding agencies were even fewer as they could only be the government or a consortium of donor agencies. It was also noted that most interviewees were either in middle or senior management positions in their respective organisations. This can be attributed to the fact that the largest number of available interviewees were from consultants and the implementing agencies, where most diploma and degree holders perform management functions. This proved to work well for the survey, as the sort of information to be gathered would best be obtained from project managers.

**4.1.2      Brief overview of projects**

Section B endeavoured to capture information on the projects the interviewees had been involved with in the past five (5) years. Mainly, questions relating to the number of projects undertaken, the contract values, and the extent to which the projects had satisfied the set objectives of budget, schedule and performance requirements were posed.

Additionally, the interviewees were asked questions pertaining to the administration of projects to provide insights into challenges that were encountered. The questions sought to draw out the bottlenecks faced on projects, what factors contributed to these bottlenecks, the effect of the problems on the projects, and the prevalence of such problems or failures of projects.

All the interviewees indicated that they had been involved with not less than five (5) projects in their experience. Further, the value of contracts managed by the interviewees ranged from USD 25,000 to USD 50,000,000. These values indicate the magnitude of the projects and the scale of resources that the Government and other financing agencies inject into the sector, and hence it is imperative that the resources are utilised efficiently and effectively through good project management.

**4.1.2.1 Budget overruns**

From the experience of the interviewees, budget overruns on projects were a common occurrence; four (4) interviewees indicated that “Many” projects they were involved with had suffered budget overruns, three (3) stated that “Quite a few” projects they were involved with had budget overruns, while another three (3) believed that the number of projects that had experienced budget overruns was “Negligible”. The responses confirm the many instances of budget overruns that were highlighted in the literature reviewed. It was quite clear that exceeding the original budget on many projects was a common occurrence and a problem that many project managers had to deal with.

This was especially highlighted to be severe on wholly government-financed projects, which is in concordance with facts reflected in Table 1, Section 1.1. Interviewees indicated that in some cases funding was so erratic that claims owing to delayed payments, interest and standing time by contractors formed a significant part of the final total project cost. Due to delayed payments, project durations increased and costs escalated. It was also pointed out that due to political and other influences, the scope of works on most government-funded projects could be increased without due regard to budgetary, schedule and other constraints. Budget overruns, if not checked, have the potential to adversely affect the completion of a project. Stringent management of the various risks that are capable of increasing project costs is thus paramount.

**4.1.2.2 Schedule overruns**

Results showed that a significant number of projects were not completed within schedule; six (6) interviewees indicated that “Many” projects they were involved with had schedule overruns, three (3) believed that “Quite a few” projects had schedule overruns, while one (1) stated that the number of projects with schedule overruns was “Negligible”.

The literature reviewed showed that one of the biggest challenges is to complete a project within time. If risks are not managed well, schedule overruns are likely to occur.



Many risks, apart from increasing costs, have the tendency to disrupt works, causing delays and hence prolonging the duration of a project.

From discussions in the interviews, it was clear that schedule risks were commonplace on road projects in Zambia. Insights from the interviewees showed that due to funding, design, and unplanned increase in the scope of works, some projects suffered protracted durations. Some of these schedule overruns were so severe that they increased the original project durations two, three and even four fold!

This point was substantiated by the statistics that are reflected in the Section 1.1 “Statement of the problem”, in which projects such as Luanshya-Mpongwe, Kasama-Luwingu and Kashikishi-Lunchinda Roads severely exceeded original project durations.

#### **4.1.2.3 Poor quality works**

Cases of poor quality works were reported on a reasonable number of projects; six (6) of the interviewees revealed that there were “Quite a few” projects with poor quality work, three (3) indicated that projects with poor quality works were “Negligible”, while one (1) stated that “Many” projects had poor quality works.

According to the interviewees, the quality of works on some projects was so substandard that some projects ended up being abandoned. To this effect, nine (9) of the interviewees revealed that they were aware of projects that failed to meet the required standards and were, thus, suspended.

From available information on local projects, sub-standard works were one of the biggest problems. A significant number of projects had registered shoddy works, caused by a number of factors. Further, general literature on project risks identified poor quality works or failure to meet performance standards as one of the common outcomes of the impact of risks.



Literature review quotes many authorities, including the second Republican President, the National Council for Construction (NCC) of Zambia and other notable senior government officials expressing concern over the low standard of work produced by local contractors and project managers.

This was thus a problem that could not be ignored. Some interviewees pointed out that one of the measures aimed at stemming the problem of sub-standard works by contractors was the strengthening of the National Council for Construction (NCC) through its transformation into a statutory body. The NCC presently oversees all construction activities and enforces construction standards. This, it is hoped, will improve the quality of works produced by contractors on projects.

#### **4.1.2.4 Key factors that contribute to projects failing to meet desired objectives**

It was necessary to identify the key or most important factors that led or contributed to some projects falling short of the desired objectives of cost, time and quality. Interviewees were thus requested to pick out, from a provided list and from their own experiences, the factors they considered most important. The findings were: four (4) of the interviewees believed that “Poor or erratic funding” contributed to poor project outcomes. Some explained that this was more characteristic with projects that were fully government-financed. In fact, most of the interviewees pointed out that all other project objectives were seriously compromised because of this single, yet vital, factor of funding;

Three (3) indicated that “Contractors’ incompetence” contributed to poor project performance; two (2) stated that “Poor project supervision” contributed to many projects failing to meet the desired objectives; and one (1) said that “Sudden change or increase in the scope of works” contributed to projects failing to meet the desired objectives.

This was quite an interesting outcome as most of the factors identified above were also listed in the literature review. This showed the seriousness of the impact that these issues, if not well managed, could have on projects. Quite often, as pointed out in earlier

sections, these factors, while occurring severally or jointly have been causing serious implementation problems on road projects in Zambia.

#### **4.1.2.5 Disputes or litigation due to occurrence of risks on projects**

As noted in the earlier part of this report, problems caused by the occurrence of risks on projects may sometimes lead to disputes and litigation. Interviewees were requested to state whether they were aware of disputes or litigation on any project due to the effect of risks.

Seven (7) interviewees stated that disputes did occur on projects, but rarely deteriorated to litigation as all efforts were made to resolve the disputes or differences, usually by applying the terms of the contract. Three (3) indicated that they had experienced disputes on projects, which were threatening to escalate to litigation, as no meaningful solution to the dispute seemed to be in sight. It was seen in the earlier literature that occurrence of risks and their impact on projects can lead to disputes or even litigation if not well-managed. Some interviewees pointed out some projects on which disputes had occurred due to occurrence of unexpected events. These disputes had led to disruption of some projects and increased costs on both the client's and contractor's sides.

#### **4.1.2.6 Prevalence of projects failing to meet objectives**

For an overview of the extent or magnitude of the problem of road projects facing implementation difficulties, interviewees were asked to rate the frequency of projects failing to meet budgetary, schedule and design requirements.

Four (4) rated the prevalence as "Medium", three (3) said that the prevalence was "High", and another three (3) rated the frequency as "Low".

It was quite evident from the interviews that many projects, especially Government of the Republic of Zambia (GRZ)-funded projects, frequently failed to meet the set objectives of cost, time and quality of works. It seemed this problem was so extensive that it was almost an accepted norm for this to occur on GRZ-financed projects. Some of



the reasons advanced included the sanctioning of road projects for political expedience, without proper analysis or evaluation of the adequacy of resources or justification of the projects. Kasama-Luwingu and Kashikishi-Lunchinda Projects were some examples named.

#### **4.1.3 Existing risk management practices**

##### **4.1.3.1 Provision for management of risks on projects**

Information was sought from the interviewees on the methods they employed in managing project risks. Predominant responses were through “Contract models”, “Insurance” and “Bank guarantees”.

Despite the provisions for risks listed above, it appeared that there was a lack of comprehensive allowance for risk management on many local projects. Most interviewees felt that the provisions singled out in the discussions were inadequate and not well-suited to manage the many and complex risks that faced projects in the modern day. Hence, the myriad of obstacles faced on projects countrywide. It was suggested that a more focused and sustained approach needed to be employed if project risks were to be ably handled.

##### **4.1.3.2 Documented risk management processes in organisations**

The survey sought to establish whether the interviewees had documented risk management processes in their various organisations. Most of the interviewees displayed knowledge of risk management; however, it appeared that risk management was applied without a clearly defined framework. All (10) of the interviewees responded that their organisations did not have a documented and established risk management process.

This situation was a cause for concern as literature advises that one of the best ways of managing or monitoring risks was the availability of a well-documented and established risk management process, which clearly outlines the identification, assessment, monitoring and treatment of risks on projects. Consequences of the absence of this framework are adverse.

The interviewees indicated that most risk management was done ad hoc, without a proper checklist or process to guide on steps to take in managing risks. This, they further stated, had resulted in some risks that were manageable getting out of hand and affecting projects.

#### **4.1.3.3 Ownership of risk management**

From information gathered in the interviews, the responsibility for risk management in the various organisations seemed to be unclear. Responses included “Chief executive officers”, “Project managers”, “All staff” and “Senior management” as persons responsible for risk management.

Even though various levels were mentioned, it was evident that most interviewees felt that the ultimate responsibility for risk management lay with chief executives or at least with senior management, most of whom had no direct or day to day dealings with projects. This was a source of concern as literature suggests that on any project, specific individuals (risk owners) ought to be charged with the responsibilities of managing specific risks. These individuals need to be members of a project team, persons that are involved with the project on a day to day basis.

When the responsibility for risk management or risk ownership is not clearly defined, it is difficult to manage risks. As a result, projects are susceptible to the adverse effects of the various risks.

#### **4.1.3.4 Application of risk management at all project stages**

To gain an understanding of the extent of the application of risk management, interviewees were asked whether they applied risk management at all project stages.

Nine (9) indicated that they applied risk management on all project stages, while one (1) stated that they did not. However, due to the absence of formal processes, there was no strict requirement for risk management at all project stages, and whatever methods were

at one's disposal were utilised. It is known that to achieve meaningful and effective risk management, a strict and clear policy on risk management practice is a necessity, one that requires the exercise of risk management on all project phases, from design to project closure. This could be one of the major challenges that our sector in Zambia faces.

#### **4.1.3.5 Implementation of formal risk management**

All (10) the interviewees indicated that formal risk management, if well implemented, could improve project performance. Many were quick to point out that formal risk management ought to be made an integral, if not mandatory, part of projects. They felt that it would be beneficial to provide a framework for risk management, which would also serve to formalise methods currently in place. The interviewees pointed out that if there was proactiveness in risk management, the performance of projects would be improved.

#### **4.1.4 Risk identification and assessment**

##### **4.1.4.1 Analysis of funding risks**

All (10) interviewees, whether consultants, contractors, implementing agencies or funding agencies, indicated that they analysed funding risks before undertaking projects. They indicated that funding had become such a concern, especially on GRZ funded projects, that all efforts were made to get assurance of financing before contracts were awarded. Though there was only one contractor and one official from funding agency, preliminary information was gathered, which would be verified in the questionnaire survey. Literature review identifies funding as one of the biggest risks that can affect a project; all project phases, i.e., design, procurement, and construction, require funding. When funding uncertainties are encountered, consequences can be devastating to the project objectives. Interviewees indicated that on a significant number of previous projects, sanctioning proceeded without real assurance or guarantee of availability of funds. Once implemented, cash flow problems would appear on the project mid-stream, and this would then be followed by associated difficulties, including delays in project completion, increased costs, and sometimes compromised quality of works.

**4.1.4.2      Assessment of natural risks**

All (10) interviewees indicated that they assessed natural risks at various pertinent stages before undertaking projects. Indications were that possible natural disruptions such as inclement weather and flooding were considered and necessary precautions taken at sanctioning, design and implementation stages to ensure compliance.

Some interviewees, however, pointed out some projects on which the effect of natural risks had caused implementation hardships. One such project was the Mongu-Kalabo road, which at the time of this report, had actually been abandoned as the contractor had deserted the site. Natural risks, though sometimes rare, can have a significant impact on a project once they occur. These are normally termed low probability, high impact risks. All efforts should be made to take into account and assess these risks on projects.

**4.1.4.3      Design risks**

All (10) interviewees indicated that they considered design flaw risks before undertaking projects. Many indicated that previously, flawed designs had a big impact on projects. As a result, design reviews had now become a norm before projects were implemented.

Design flaws were identified in literature review as one of the risks that may affect the attainment of project objectives. In Zambia, some projects encountered difficulties due to incomplete or poor designs in the initial project stages. Remedying poor designs or the impact of poor designs during project implementation can be difficult and costly. Design reviews were thus deemed necessary to ensure elimination of these risks before undertaking a project. Thus, all designs submitted by any consultant to the client were subject to review by an independent consultant, selected by the client to undertake the task.

**4.1.4.4      Risks likely to occur on projects**

Interviewees were requested to identify risks that occurred most often on their projects. A comprehensive list of known risks was provided for the purpose. As can be seen from the Table 4.1, the commonest factor believed to cause projects to fail to meet objectives

was poor or erratic funding. Ten (10) or all of the interviewees listed funding as one of the major risks that were likely to occur on projects. The next rated significant risk factors were:

- political (9 interviewees);
- natural hazards (9 interviewees);
- foreign currency instability risks (9 interviewees);
- Input or material price escalations (8 interviewees); and
- Shortage of materials (8 interviewees).

In the literature review, these risks were identified as the biggest risk factors likely to occur on projects. And the interviews also reflected that. Focus should thus be given to the proper management and treatment of these risks. See the Table 4.1.

**Table 4.1:** Risks likely to occur on projects

Item No.	Risk	No. of respondents who identified risk
1	Funding risks such as poor or inconsistent funding	10
2	Political risks	9
3	Natural hazard risks such as climatic conditions, geotechnical conditions, floods	9
4	Foreign exchange rate instability	9
5	Input or material price escalations	8
6	Shortage of materials	8
7	Poor or incomplete designs	5
8	Contractor inexperience or incompetence	5
9	Difficulty in meeting environmental regulations and requirements	3
10	Procurement and contract model risks	2
11	Legal and policy risks	2
12	Labour unrest risks	2

#### 4.1.4.5 Dealing with occurrence of risks on projects during implementation

Information was sought to establish what measures interviewees were aware of that are taken when risks occurred on projects. Four (4) interviewees stated that a financial

provision was made, another four (4) stated that the project period was increased, while two (2) indicated that the design was changed.

As can be seen, many interviewees indicated that risks were catered for mainly by adding money and time. In some cases, however, design alterations were a possibility. Nonetheless, the interviewees pointed out that it was not always easy to take these options as the required funds would not always be available.

According to available literature on risk management, when risks occur during implementation, additional financing and time should be available to help tackle the risks, or effects of risks. Most often, such provisions would have already been made before implementation, so that such allowances are already integrated in the project implementation plan.

#### **4.1.4.6 Sum added to contract amount to deal with risks**

Interviewees were asked to state how much, as a percentage of the contract sum, was normally added to the contract to deal with risks when they occurred during implementation of a project.

Most indicated that the percentage applied in contracts to cater for risks was either 10%, which was largely provided for in the contract sum as “Contingencies”, or up to 25%, which the client was permitted to apply in “Variations” to the contract by the tender authority.

However, many interviewees felt that even though a provision existed, when risks occurred, the impact might be so high that the provision would prove inadequate. Six (6) interviewees indicated that the sum did not adequately cater for risks, while four (4) stated that the sum did adequately cater for risks.

An earlier look at the performance of projects in Zambia revealed that when risks occurred on many projects, measures in place did not adequately cater for the impact of

the risks. In fact, it appears that better and more flexible and responsive measures of managing risks are needed if our projects are to improve. Mere contingencies or variations seemed inadequate. The latter has no basis and is indeed an arbitrary figure, while the former is an “after thought”, which may not always address the problem.

#### **4.1.4.7 Ranking of organisations’ risk management practices**

Interviewees were allowed to rate their organisations’ risk management practices according to what they perceived.

Eight (8) interviewees indicated that their organisations’ risk management was “Good”, and two (2) indicated that it was “Poor”. However, many felt that there was a lot that could be done to improve risk management in their various organisations. There was a general feeling that risk management in organisations was too informal and there was no proper framework that existed to guide its application. Many felt that risk management without a guiding policy or framework was a risk in itself, as risk management was supposed to be a systematic, guided and structured process if the full benefits were to be attained.

From available information, however, it does seem that most organisations have poor risk management measures in place. This is the reason for many projects running into various problems.

#### **4.1.4.8 Allocation of funds to support risk management**

All (10) interviewees indicated that they would be willing to allocate funds to support risk management. They further stated that sensitisation of various stakeholders on the benefits of risk management and the drawing of a clear framework for it was required.

All interviewees seemed to agree that formal risk management was an activity that ought to be an integral part of any project and should thus be separately recognised and funded. The cost of funding a risk management process can be far lower than the cost of dealing with the effects of unmanaged risks on projects, and its benefits far outweigh the consequences of lack of it.

#### **4.1.4.9     Insights or comments on risk analysis and management on road projects in Zambia**

Generally, the interviewees felt that measures needed to be taken to manage risks. When risks occurred on projects, remedial actions took too long to implement.

The interviewees also pointed out that funding instability led to poor project performance and that there was serious need for tools for managing project risks. Others felt that there was a dire need to categorise various project risks and deal with them appropriately.

One thing that came out was the lack of documented or formal risk management processes. Some interviewees applied risk management without being aware or realising that certain actions or processes they followed were actually “risk management”. Many interviewees indicated some knowledge of the practice, but were not aware that it is a field on its own that had to be formally learnt and applied in its own right. As such, no systematic application of the process was achieved.

The information collected assisted in the formulation of the proposed model for management of risks in the implementation of public funded road projects in Zambia.

The next section deals with questionnaire survey results, undertaken to provide for a “between methods” triangulation.

### **4.2     Summary**

The structured interviews helped bring out the preliminary issues regarding project implementation and management in the Zambian road sector. A number of issues were brought out regarding bottlenecks in road project implementation, including a number of issues regarding project risk management.

Pertinent risks were identified, together with project objectives affected by these risks. Further, preliminary indications regarding poor or lack of risk management were raised.



## **CHAPTER 5: QUESTIONNAIRE SURVEY ANALYSIS AND DISCUSSION OF RESULTS**

### **5.0 Introduction**

Following the preliminary structured interviews, a questionnaire survey was undertaken on a much wider scale. The survey was conducted over a period of four (4) months from November 2006 to February 2007. The purpose of this survey was to examine in detail the various issues that were raised in the earlier exercise. A much larger sample and a more detailed questionnaire were used. According to the NCC register, there are not more than thirty (30) large scale road contractors in Zambia. Thus, a total of twenty (20) contractors were targeted for the questionnaire survey. According to a register obtained from the Association of Consulting Engineers of Zambia (ACEZ), there are no more than fifteen (15) member consultants in Zambia. Thus a total of ten (10) consulting firms were selected for the questionnaire survey. Two (2) implementing agencies, the RDA and the MLGH were selected.

Funding agencies such as the NRFA, the World Bank (WB), the European Union (EU), the Danish International Development Agency (DANIDA), the Norwegian Development Agency (NORAD) and the Swedish International Development Agency (SIDA) were also targeted for the questionnaire survey. A total of fifty-five (55) questionnaires were distributed, and in some cases, to more than one individual in an organisation. A total of thirty-four (34) questionnaires were received back. This represented a response rate of 62%.

Questionnaire surveys have an advantage in that a researcher can obtain information from respondents in a manner that is quick and is comfortable for the respondents as the respondents are free to complete the questionnaires anonymously and privately.

Apart from the major cost of stationery, questionnaire surveys are cheap and easy to implement and administer to as many respondents as needed. In this way, a lot of information can be gathered.

During data analysis, questionnaires are easy to compare and evaluate since the questions are standard. The basis for comparison is thus standard.

However, there are some disadvantages to this method. The feedback from the respondents may not be diligent as some respondents may complete the exercise with little seriousness. There are instances where respondents deliberately provide responses that they do not necessarily mean, and others complete questionnaires with arbitrariness. In some cases, respondents do not exercise honesty in their responses.

It is sometimes very difficult to get respondents to complete a questionnaire on time, especially that there is no physical presence or pressure from the researcher that may prompt them to do so. Often, the questionnaires may end up on shelves or even in trash cans! Thus, the response rate may be poor, and a figure of fifty (50) percent response is generally considered adequate.

Sometimes the questions may be limiting due to provision of set responses and the wording may be leading to the respondents. Thus there is no flexibility, and an opportunity to gather valuable information which the respondents would have provided may be lost.

If pre-testing is not carried out properly, questionnaires may sometimes prove difficult to understand or may contain some ambiguities, which can affect the way each respondent understands questions, and hence affect the results.

The questionnaire was divided in four (4) sections: Section 1: Profile of respondent; Section 2: Profile of organisation; Section 3: Overview of projects implemented; and Section 4: Risk analysis and management.

The data collected was evaluated using both qualitative and quantitative methods. The questionnaire survey was the main data source of the research, and also served to validate the findings of the structured interviews. Results of the data analysis would

form the basis for the risk management model to be proposed for the **Zambian Road Sector**.

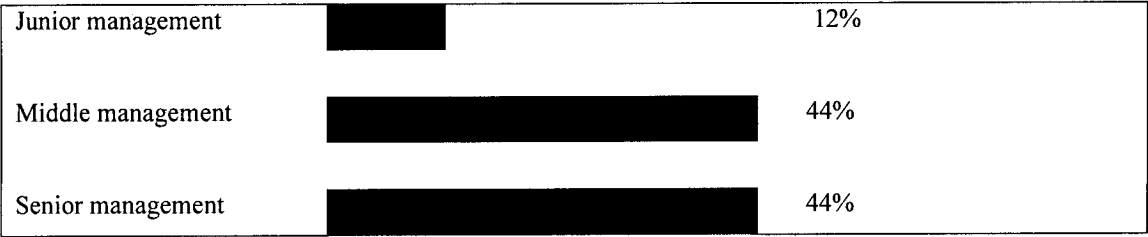
A copy of the survey questionnaire is attached in **Appendix B**.

**5.1 Profile of respondents**

**5.1.1 Position of respondents in firm**

Preliminary information regarding the positions that the various respondents held in their organisations was requested. This was done in order to establish the level of authority and decision making powers the respondents had. The results revealed that twelve (12) percent were in junior management positions, forty-four (44) percent were in middle management positions, while another forty-four (44) percent were in senior management positions.

It had been established earlier in the structured interviews that people in junior management positions were mainly concerned with the actual implementation of projects, or the “hands-on” part of project implementation. Middle management to senior management personnel were, on the other hand, found mainly to have been involved with project or contract administration and management. Issues of risk management, therefore, were identified to mainly be in the domain of this band. The results are summarised in **Figure 5.1**.

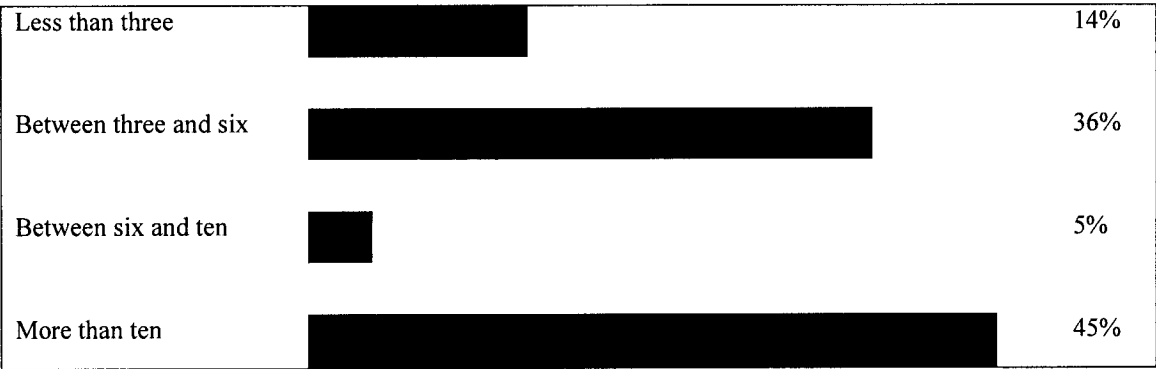


**Figure 5.1:** Position of respondents in organisations

**5.1.2 Years of employment in organisation**

As later sections of the questionnaire sought to establish the level of risk management practices in the various organisations involved in the questionnaire survey, it was vital to establish the longevity of service of the respondents. Longer serving employees would obviously provide more reliable and detailed information regarding the contract management practices of the organisation. Thus, information was sought on the number of years the respondents had worked for their various organisations.

Fourteen (14) percent had worked for their current employers for less than three (3) years, thirty-six (36) percent had worked for between three (3) and six (6) years, five (5) percent had worked for between six (6) and ten (10) years, while forty-five (45) percent had worked for more than ten (10) years. This distribution was considered suitable as a good portion of the respondents were in employment for a considerable period of time with their current employers. This information is summarised in Figure 5.2.

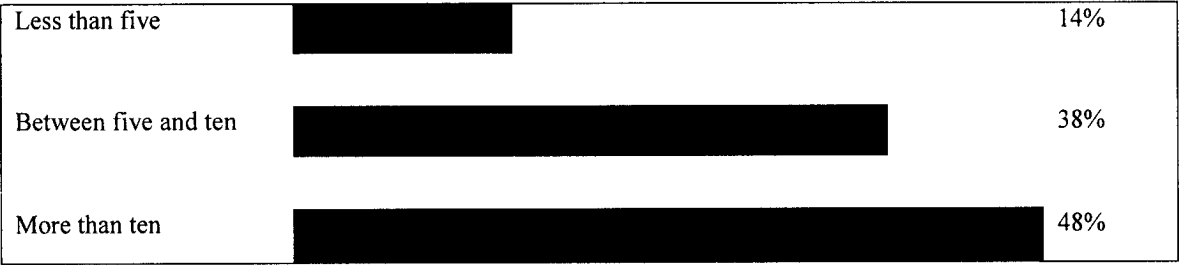


**Figure 5.2:** Years of employment of respondents in firm

**5.1.3 Experience of interviewees in road sector**

Next, it was found prudent to establish the years of exposure the respondents possessed in the road sector. It was vital to narrow down to this level as the focus of this research was on the management of risks on road projects. Quite clearly, the more the experience a respondent had in the road sector, the better informed they were regarding various project issues, and thus the more reliable and representative their responses would be.

Fourteen (14) percent of the respondents were found to have less than five (5) years of experience in the road sector, thirty-eight (38) percent were found to have between five and ten years experience in the road sector, while forty-eight (48) percent were found to have more than ten (10) years working experience in the road sector. This distribution was considered suitable as a good portion of the respondents had vast and varied experience in the road sector. This information is summarised in Figure 5.3:



**Figure 5.3:** Years of experience of interviewees

**5.1.4 Number of projects managed**

Having established the number of years the respondents had worked in the road sector, the questionnaire next sought to establish the number of road projects the individual respondents had managed or been involved with. The rationale was to delve further and establish, other than the “quantity” of years respondents had in the road sector, the quality of that experience. The most suitable way to capture this data was through establishing the number of road projects the respondents had actually actively been involved with or managed. The minimum value of these projects was ZMK 10.0 billion (approximately USD 3.0 million).

It was found that thirty-six (36) percent had managed less than ten (10) projects, thirty-two (32) percent had managed between ten (10) and twenty (20) projects, while thirty-two (32) percent had managed more than twenty (20) road projects. Again, this distribution was considered suitable as a good portion of the respondents had managed or been actively involved with a considerable number of road projects. This information is summarised in Figure 5.4.



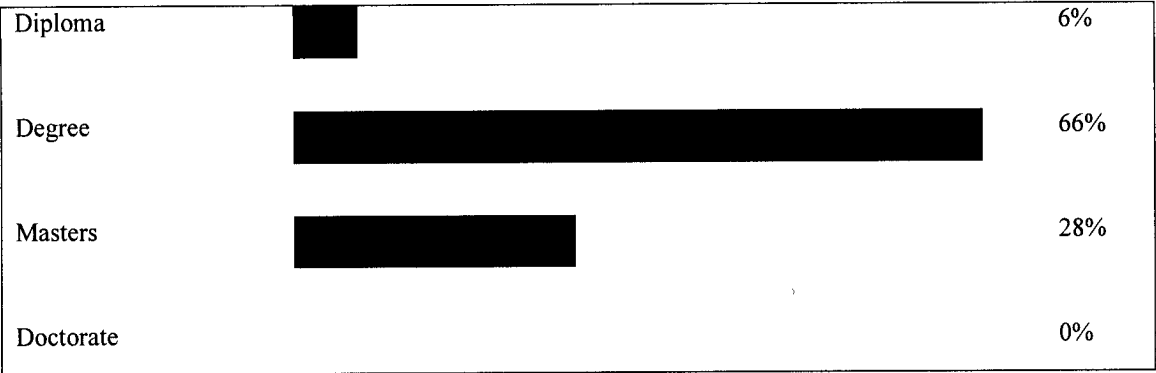
**Figure 5.4:** Number of projects managed by respondents

**5.1.5 Highest level of education**

It had been observed from the structured interviews that project or risk management skills accrue, not only by experience in handling projects, but to an extent also by the level of education or academic qualifications attained. There were many pointers to the fact that the higher one goes on the academic ladder in the engineering field, the higher the probability of exposure to various project management aspects, including risk management. Interviewees with Degree qualifications or higher had more understanding and were more elaborate with issues of risk management than those with more humble qualifications. Thus, the questionnaire included a part where respondents were expected to state their highest education levels in engineering for this purpose.

The information gathered showed that six (6) percent of the respondents had a Diploma qualification, sixty-six (66) percent had a Degree qualification, twenty-eight (28) percent had a Masters qualification, while none held a Doctoral qualification.

The results showed that most of the respondents targeted in the various organisations held degree qualifications or higher. This worked well for the research as it is this bracket that is in at least middle management positions, and that is mainly involved with project management and the project decision-making process. Therefore, it was anticipated that more of the respondents would be familiar with project risk management processes. This information is summarised in Figure 5.5.



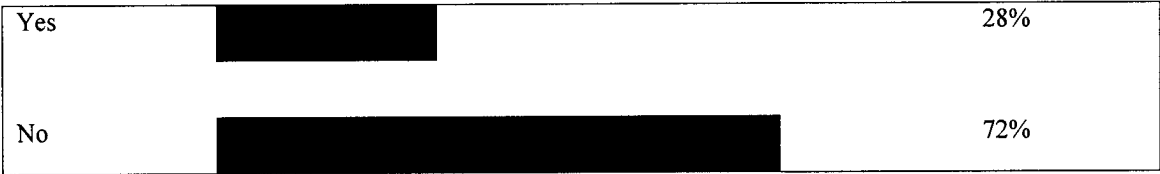
**Figure 5.5:** Highest level of education of respondents

**5.1.6 Formal training in risk management**

Having established the extent of experience in road projects and the level of education attained by the various respondents, it was felt necessary to establish whether the respondents had received or at least been exposed to any form of formal risk management training.

Interestingly, despite the large number of respondents with high academic qualifications, i.e., at least Degree level, and the vast experience shown, very few of the respondents had ever received formal training in risk management. This picture, it can be argued, probably did bring to the fore the sheer lack of emphasis by the various organisations on risk management. One would have expected that a larger portion of the respondents would have received risk management training, in one form or the other.

This being the case, it does or may point to an underlying fundamental problem in how road projects are managed in Zambia. There are huge resources being poured in the improvement of road infrastructure, and it is thus ironic that little or no emphasis is being placed on the proper training of project managers, especially in the risk management sphere. In this modern day age when projects are becoming more and more complex, project managers are correspondingly expected to be sharpening their skills and acumen, if efficient and effective project management is to be attained. This information is summarised in Figure 5.6.



**Figure 5.6:** Does respondent have formal training in risk management?

**5.2 Profile of organisation**

**5.2.1 Type of organisation**

Section 5.1 dealt mainly with information regarding the individual respondents. This section now deals with information regarding the organisations in which the various respondents are employed.

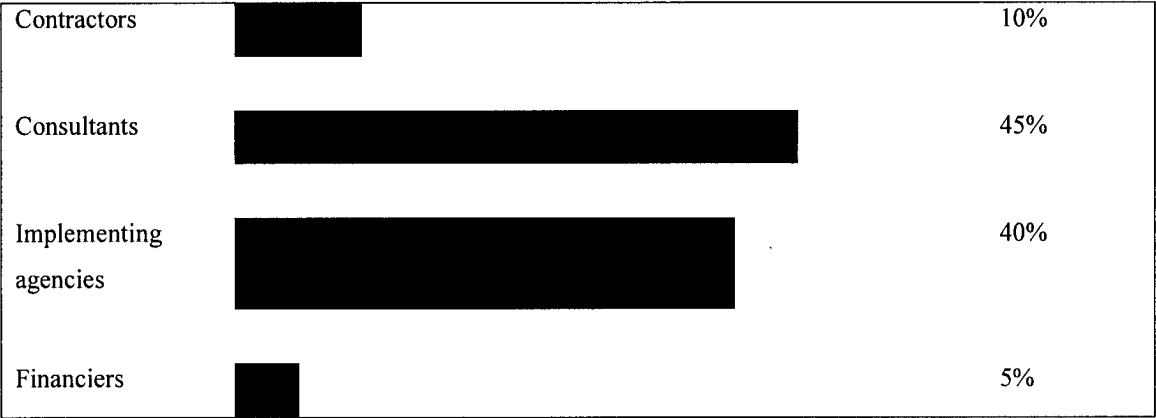
As there are various players in the road sector, it was seen prudent to identify the type of organisations for which the respondents worked. This information was necessary for the purposes of determining the proportion of respondents that worked in each type of organisation so that subsequent information gathered would be evaluated according to the distribution so obtained. Initially, the intention was to obtain as balanced a respondent configuration as possible among all the organisations involved, viz.: Contractors, Consultants, Implementing agencies and Financiers.

Unfortunately, the proportion of responses from Contractors, at ten (10) percent and Financiers, at five (5) percent, was very low. This could be attributed to the following reasons: Large scale road contractors in Zambia are very, very few. Even though the NCC register indicated approximately thirty (30) large contractors, it appeared that not many were actively involved with large road projects. During the research, it was found that there is a myriad of small scale road contractors in Zambia, and their domain is mainly in very small or simple road works. The target for the research was large contracts whose values were not less than ZMK 10.0 billion (approximately USD 3.0 million), as these were the projects which were mainly susceptible to risks. These projects are described in Section 1.4 “Research delineation”.



Financing institutions are very few, especially with the new policy of direct budget support to implementing agencies, where now all donors pool their financial assistance in one vault, which is then managed by the National Road Fund Agency (NRFA). In this manner, instances of donors funding or dealing directly with a specific project are far fewer. As a result, project management and monitoring have now been left with the relevant bodies as constituted by the Public Roads Act No. 12 of 2002.

The bulk of the number of respondents came from Consultants (45%) and Implementing agencies (40%). Registered consulting firms are not more than 15 in number. Figure 5.7 summarises the results.



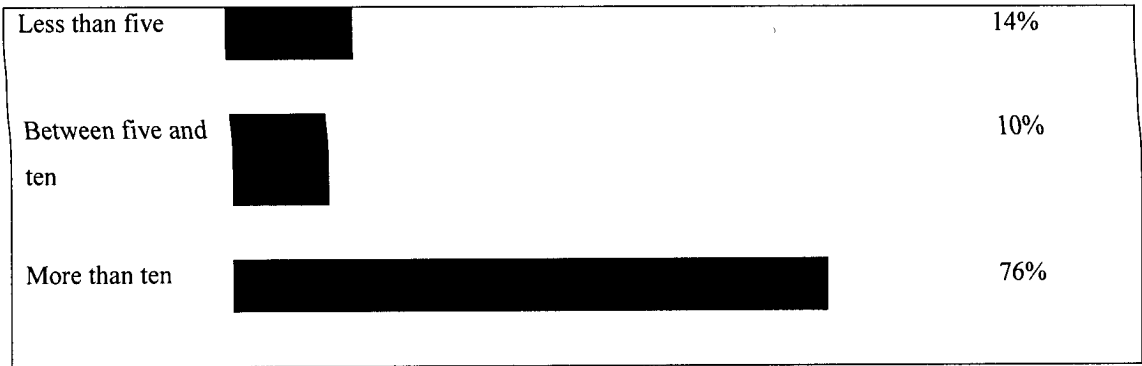
**Figure 5.7:** Type of respondent organisations

**5.2.2 Years of existence of organisation**

As organisations grow, they develop certain best cultures and practices that are refined over the years. Organisational or institutional experience also plays a major role in project management practices. Therefore, it is assumed that longer existing organisations or firms possess more institutional experience. This information was deemed vital as such entities would have been exposed to a considerable number of road projects, and thus vast scenarios and experiences regarding project management. Detailed and reliable information was thus expected from these organisations.

Fortunately, by far, most of the institutions involved in the survey had been in existence for more than ten (10) years; this number in percentage terms represented seventy-six

(76) percent of the respondents. Fourteen (14) percent of the respondents indicated that their firms had been in existence for less than five (5) years, while ten (10) percent of the respondents indicated that their organisations had existed for between five (5) and ten (10) years. The information is summarised in Figure 5.8.



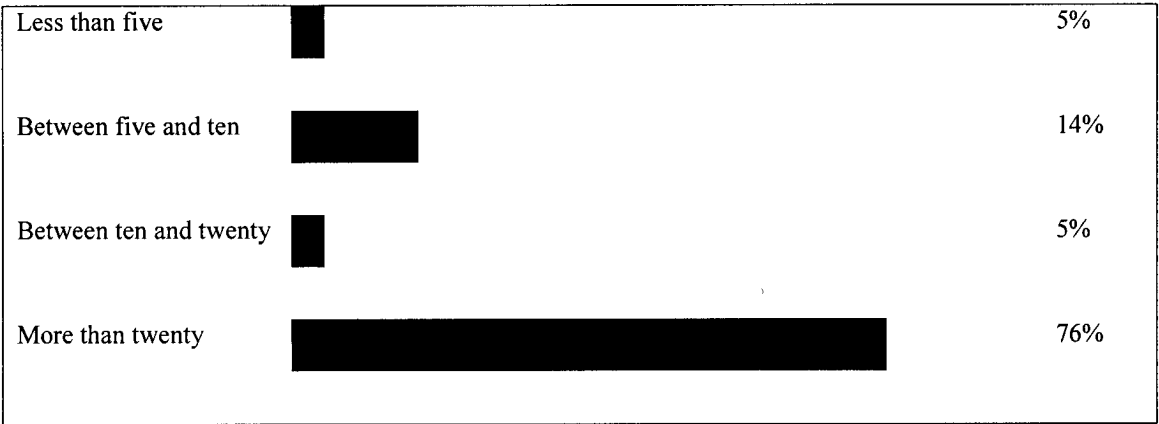
**Figure 5.8:** Years of existence of respondent organisations

### 5.2.3 Number of road projects since inception

As a follow through to 5.2.2 above, respondents were requested to state how many projects their respective organisations had undertaken since inception. It is expected that if an organisation has handled more the road projects, it will have richer experiences and, thus, useful information relating to project risks would be obtained.

Five (5) percent of the respondents indicated that their organisations had undertaken or been exposed to less than five (5) road projects, fourteen (14) percent indicated that their organisations had undertaken between five (5) and ten (10) projects, five (5) percent indicated that their organisations had undertaken between ten (10) and twenty (20) projects, while seventy-six (76) percent of the respondents indicated that their organisations had executed more than twenty (20) road projects.

It was thus seen that an ample proportion of the sample had been involved with a substantial number of projects. It was thus expected that information supplied relating to project risk management would be sound and satisfactorily representative of the obtaining situation. See Figure 5.9 for summary.

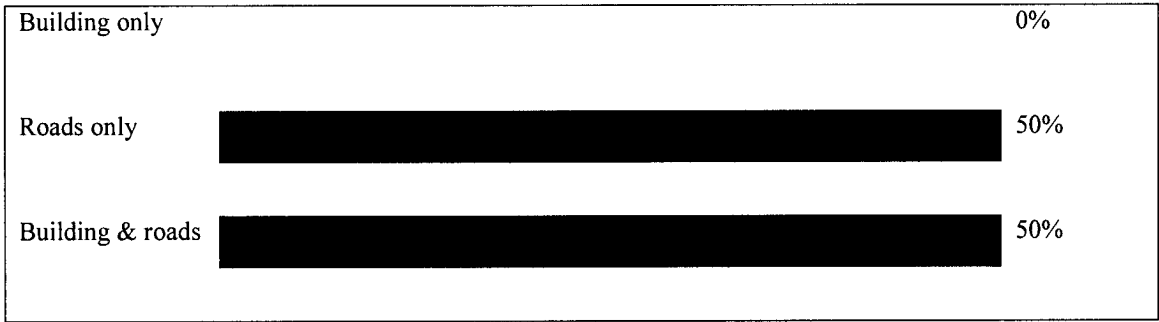


**Figure 5.9:** Number of road projects handled by respondent organisations

**5.2.4 Type of projects**

Next, it was considered necessary to establish the type of project the various organisations had been involved with. As stated earlier, the ultimate focus of this research was on the management of risks on road projects. Therefore, more useful project risk management information would be gathered from firms that had a bias towards or been involved mainly with road projects.

Results showed that fifty (50) percent of the respondents worked for organisations which solely dealt with road works, while another fifty (50) percent of the respondents worked for organisations that focused on both road and building projects. None (0%) were from firms that dealt with building projects only. This distribution was considered suitable as a good portion of the respondents had vast and varied experience in the road sector. This information is summarised in Figure 5.10.



**Figure 5.10:** Type of projects handled by respondent organisations

5.3 Overview of projects implemented

5.3.1 Road projects not completed within original budget

To obtain an insight of project implementation, the respondents were requested to provide information on the proportion of projects that they had experience with that had not been completed within the original cost estimates or contract price.

The objective of this question was to establish the extent of budget overruns and later provide a basis for possible causes of this particular problem. Fifteen (15) percent of the respondents indicated that “None” of their projects had overshoot the budget, five (5) percent indicated that “Very few” of their projects had overshoot the budget, twenty-five (25) percent indicated that “Quite a few” of their projects had overshoot the budget, while ten (10) percent indicated that “Very many” of their projects has overshoot the budget. As expected, forty-five (45) percent of the respondents indicated that “Many” of their projects had had budget overruns. This information is summarised in Figure 5.11.

The earlier sections of this research indicated that budget overruns were a common and worrying occurrence on many projects in Zambia. Some projects have even ended up costing more than double the original estimate. Where additional funding for such overruns is not forthcoming, projects are sometimes considerably delayed or even abandoned.

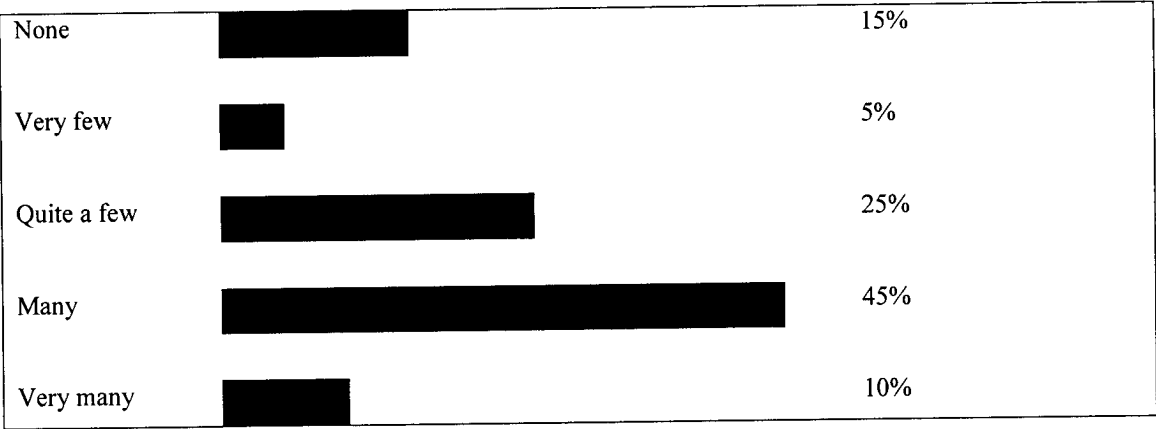


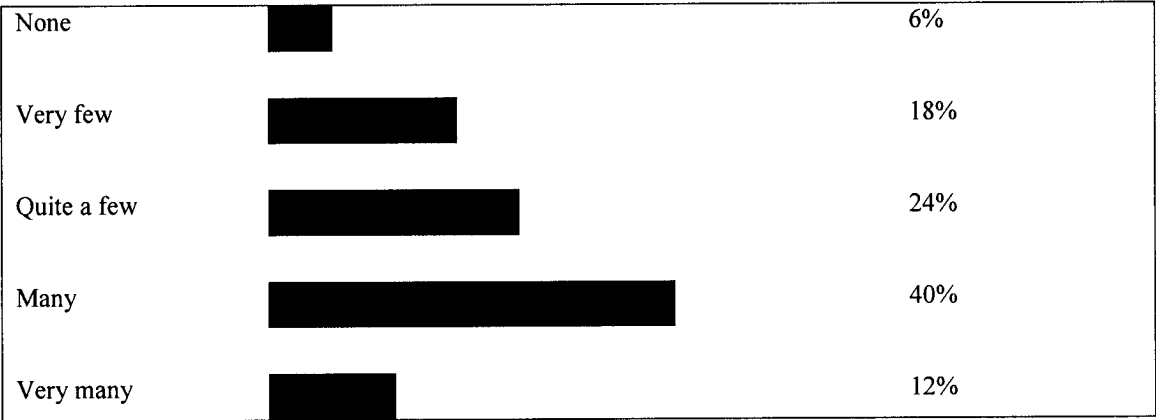
Figure 5.11: Projects not completed within budget by respondent organisations

**5.3.2 Road projects not completed within original schedule**

In line with 5.3.1 above, to obtain further insight of project implementation, the respondents were requested to provide information on the proportion of projects that they had experience with that had not been completed within the original schedule or contract period.

The objective of this question was to establish the extent of schedule overruns and later provide a basis for possible causes of this particular problem. Six (6) percent of the respondents indicated that “None” of their projects had overshoot the budget, eighteen (18) percent indicated that “Very few” of their projects had overshoot the budget, twenty-four (24) percent indicated that “Quite a few” of their projects had overshoot the budget, while twelve (12) percent indicated that “Very many” of their projects has overshoot the budget. Forty-five (40) percent, unsurprisingly so, of the respondents indicated that “Many” of their projects had had budget overruns.

Again, earlier sections of this research indicated that schedule overruns were a perpetual and disquieting aspect in the implementation of many road projects in Zambia. Information of many projects that have taken significantly longer than originally envisaged abounds. It is not uncommon for such projects to be abandoned and thus fail to achieve the desired goal, i.e., that of provision of sound road infrastructure for the nation. Figure 5.12 summarises the results.

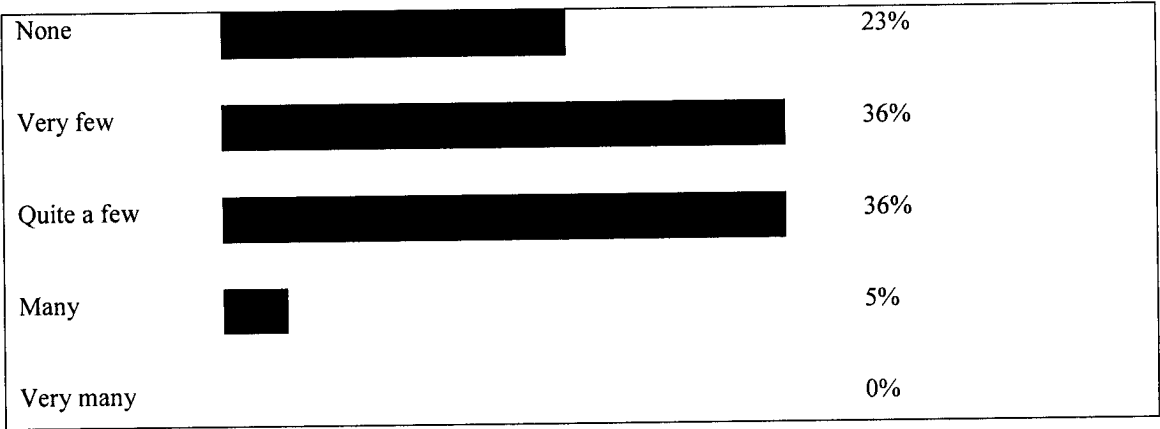


**Figure 5.12:** Projects not completed within schedule by respondent organisations

**5.3.3 Road projects that failed to meet the required standard or design**

One of the many concerns on road projects is the delivery or completion of the project according to the required standard or design. Literature has shown us that workmanship or quality of works can sometimes be a major source of concern for many projects. Responses from the respondents were as follows. Twenty-three (23) percent stated that “None” of their projects failed to meet the required standard or design, thirty-six (36) percent indicated that “Very few” of their projects failed to meet the required standard or design, another thirty-six (36) percent indicated that “Quite a few” of their projects failed to meet the required standard or design, five (5) percent stated that “Many” of their projects failed to meet the required standard or design, while none stated that “Very many” of their projects failed to meet the required standard or design.

These results are quite inconsistent with what has actually been observed in the road sector, and backed by what reviewed literature has shown. Literature reviewed during the course of this project showed that there are indeed many cases of poor workmanship or failure to meet set design standards on road projects in Zambia. Consequently, it was expected that the percentage of responses should have weighed more on “Many projects had failed to meet the required standard or design”. In fact this is quite a unique problem in Zambia in that even where funding and duration are adequate, many works are delivered sub-standard. The results are summarised in Figure 5.13.

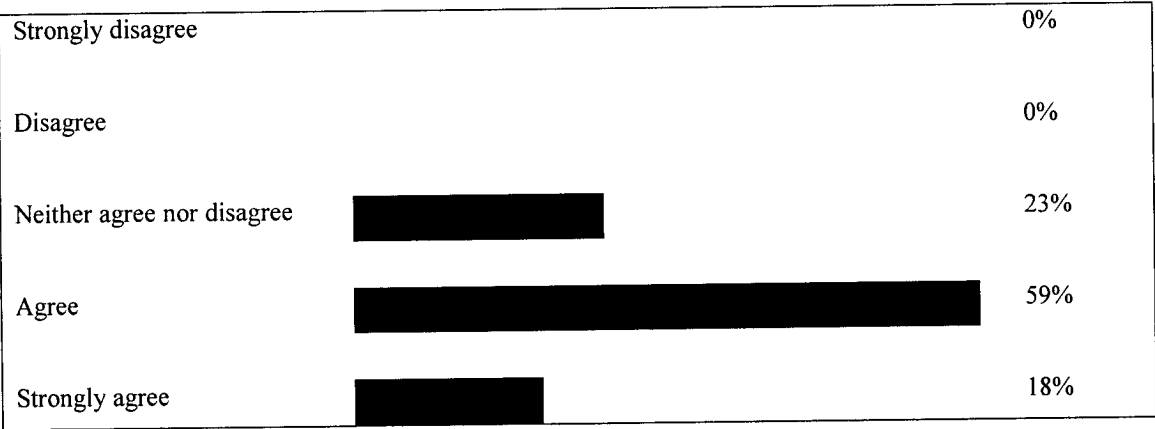


**Figure 5.13:** Projects not meeting specified quality standards

**5.3.4 Allocation of funds for the risk management function**

Respondents were asked to indicate whether their organisations would be willing to allocate funds to support the implementation of a formal risk management plan. It was discovered that many organisations did not possess a formal risk management policy and plan, and thus most risk management was largely done without any proper framework or guidance. Going by the findings, most firms would do well to invest in risk management processes and to allocate financing for the actual process during all project stages. In fact, it should go as far as allowing a provision for risk management costs in contracts. Also risk management plans should be made a pre-requisite during bidding, and contracts awarded on the basis of a good risk management plan.

Twenty-three (23) percent of the respondents “Neither agreed nor disagreed” that their organisations were willing to allocate funds for risk management, fifty-nine (59) percent “Agreed”, and eighteen (18) percent “Strongly agreed” that their firms would be willing to allocate funds for the risk management function. None “Disagreed” or “Strongly disagreed”. The results are summarised in Figure 5.14.



**Figure 5.14:** Level of agreement by respondents with willingness to allocate funds for risk management

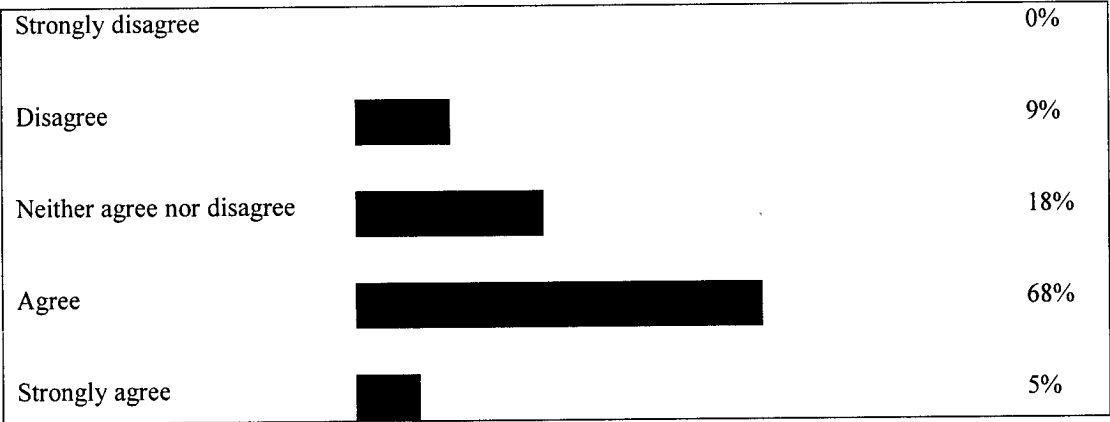
**5.4 Understanding project risk management**

**5.4.1 Common understanding of project risk management in organisation**

Respondents were requested to state whether or not the understanding of risk management was clear and common in the organisation. One of the basic requirements

for effective risk management in an organisation is that all staff ought to have a common understanding of the risk management function.

None of the respondents “Strongly disagreed” that there was a common understanding of project risk management in their organisation, nine (9) percent of the respondents “Disagreed”, eighteen (18) percent “Neither agreed nor disagreed”, sixty-eight (68) percent “Agreed” that there was a common understanding of project risk management in their organisation, while five (5) percent “Strongly agreed” that there was a common understanding of risk management in their organisations. The results are summarised in Figure 5.15.



**Figure 5.15:** Level of agreement by respondents with existence of clear policy on project risk management in their organisations

**5.4.2 Documented project risk management procedures and guidance to staff**

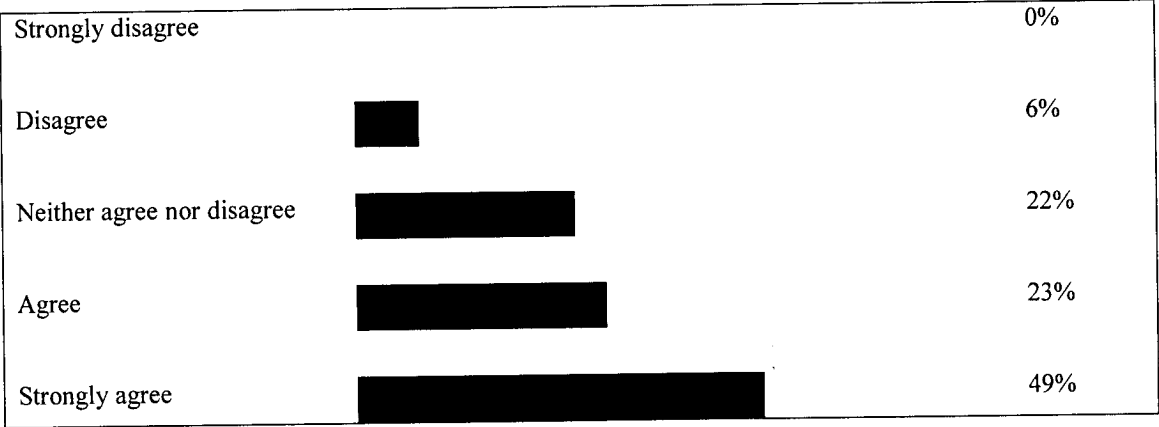
In the previous question, the respondents were asked to state if staff in their organisations had a common understanding of the risk management function. This question was a follow up, so that the respondents were requested to then state whether or not the risk management processes and procedures were documented and guidance provided to staff on the management of risks.

Forty-nine (49) percent of the respondents “Strongly agreed” that their organisations had documented project risk management procedures and provided guidance to staff on risk management, twenty-three (23) percent “Agreed”, twenty-two (22) percent “Neither



agreed nor disagreed”, while none “Strongly disagreed” that their organisations had documented project risk management procedures and provided guidance to staff on risk management. The results are summarised in Figure 5.16.

Literature recommends that effective risk management requires the establishment of well documented risk management procedures and processes for use by all staff, and that clear guidance regarding risk management should be provided to all staff.



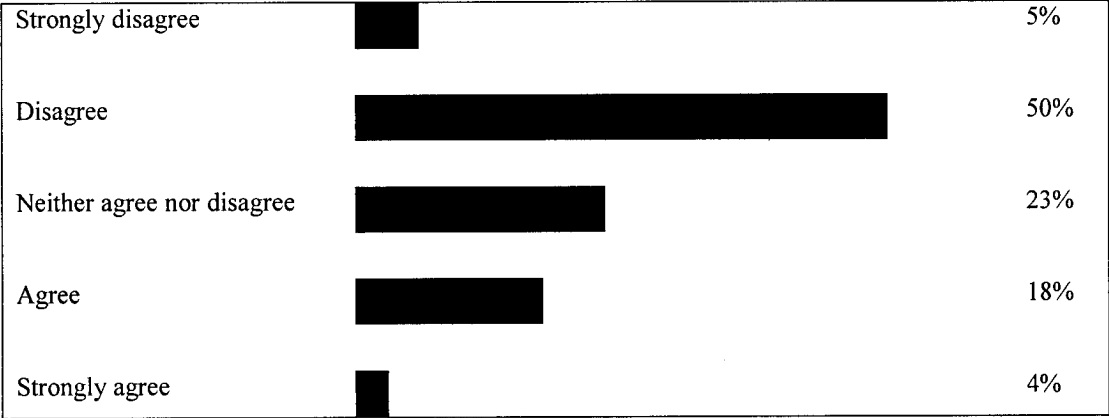
**Figure 5.16:** Level of agreement by respondents with existence of documented project risk management processes in their organisations

**5.4.3 Responsibility for project risk management in organisation**

Having established the understanding of risk management in the organisations and the presence of documented risk management processes, it was imperative to establish whether the responsibility for risk management was clearly set out and understood in the various organisations involved in the research.

Five (5) percent “Strongly disagreed” that the responsibility for risk management is clearly set out and understood in their organisations, fifty (50) percent “Disagreed”, twenty-three (23) percent “Neither agreed nor disagreed”, eighteen (18) percent “Agreed”, while four (4) percent “Strongly agreed” that the responsibility for risk management is clearly set out and understood in their organisations.

This outcome was quite surprising; while the respondents reported that they had a common understanding of risk management in their organisations and that their organisations had well-documented project risk management procedures and provided guidance to staff on risk management, the same respondents on the larger part stated that it was not clear who was responsible for risk management on their projects. All risks, for them to be effectively managed, need to have “risk owners”. When nobody takes ownership, and nobody monitors risks, it is highly likely that most risks will go unmanaged. This obviously is a recipe for disaster. This thus brought the question of whether the existing risk management procedures were comprehensive or adequate to address the many and complex risks facing today’s projects. The results are summarised in Figure 5.17.



**Figure 5.17:** Level of agreement by respondents with existence of clearly defined responsibility for project risk management in their organisations

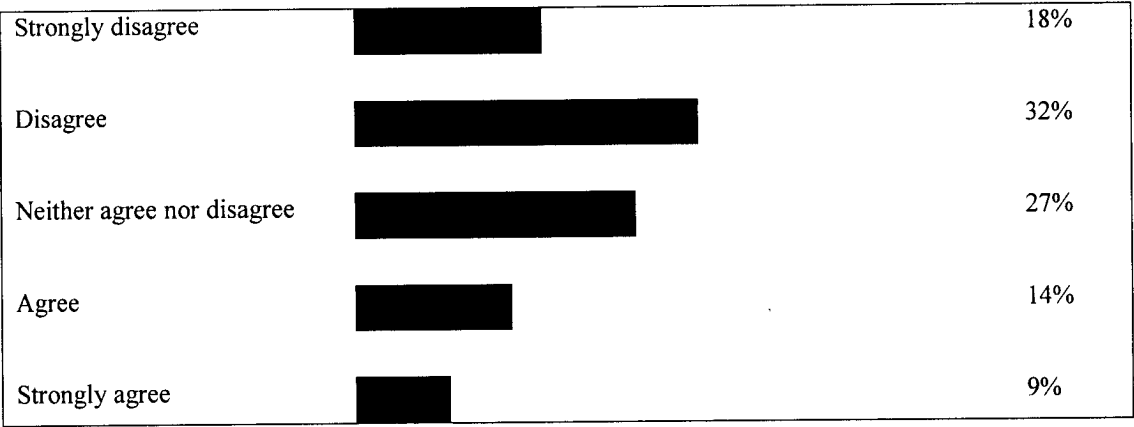
**5.4.4 Risk management tool kits or software**

Modern day risk management has evolved to a level where tool kits or advanced software are mainly utilised in the management of project risks. In that regard, the respondents were required to state what software or tool kits their respective organisations used in the management of risks.

Eighteen (18) percent “Strongly disagreed” that their organisations use tool kits or software for management of project risks, thirty-two (32) percent “Disagreed”, twenty-seven (27) percent “Neither agreed nor disagreed”, fourteen (14) percent “Agreed”,

while nine (9) percent “Strongly agreed” that their organisations use tool kits or software for management of project risks.

This scenario is somewhat disconcerting as it would be expected that most of these organisations, looking at the value and complexity of road projects they manage, would have taken significant steps in keeping with the modern technological innovations for the dealing with risks and overall management of projects. Such tool kits and software are readily available on the market. The results are summarised in Figure 5.18:



**Figure 5.18:** Level of agreement by respondents regarding use of risk management toolkits in their organisations

**5.5 Risk identification**

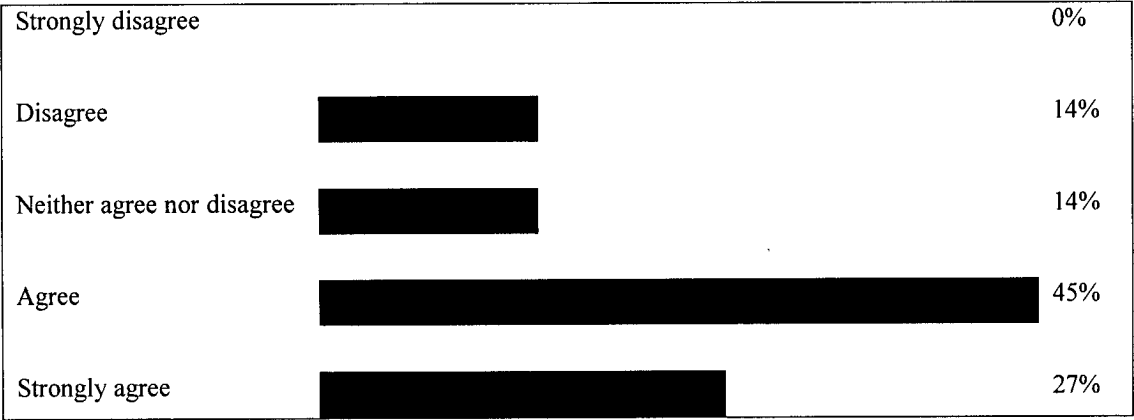
**5.5.1 Identification of main potential risks**

The respondents were asked to state whether their organisations identified the main potential risks relating to each of the core project objectives (i.e., completion to cost, time and specification).

Twenty-seven (27) percent of the respondents “Strongly agreed” that their organisations identified potential risks on projects, forty-five (45) percent “Agreed” that their organisations identified potential risks on projects, fourteen (14) percent “Neither agreed nor disagreed” that their organisations identified potential risks on projects, and another fourteen (14) percent “Disagreed” that their organisations identified potential risks on

projects. None of the respondents “Strongly disagreed” that their organisations identified potential risks on projects.

One of the fundamental requirements and precursors for project implementation, as seen in the Literature Review, is the identification of the main risks that would impact on the completion of the project according to original cost, original duration and according to the design specifications. This step ensures and increases the chances of the successful implementation of any project as set out in its objectives. The results are summarised in Figure 5.19.



**Figure 5.19:** Level of agreement by respondents regarding identification of main risks by their organisations

**5.5.2 Type of risks identified**

Respondents were then required to tick, from a checklist provided, the type of risks that their respective organisations identify on projects. The results shown are the percentage of respondents who indicated that the particular risk is identified by their organisations during or prior to project implementation. The identified risks are ranked in descending order in Table 5.1.

**Table 5.1:** Type of risks identified

	Type of risk	Percentage of respondents who stated that this risk is identified (%)
1	Financial risks (poor or inconsistent funding)	95
2	a) Natural hazard risks (climatic conditions, earthquakes, bushfires, floods) b) Poor or incomplete designs	77 77
3	a) Political risks b) Shortage of materials risks	73 73
4	Procurement and contract model risks	50
5	a) Legal and policy risks b) Difficulty in meeting environmental regulations and requirements	45 45
6	Labour unrest risks	41

As can be seen, the commonest, and probably, most worrying risk factor on many road projects in Zambia today is financial. Funding risk has the highest likelihood of occurrence. It has thus far been established that the absence or inconsistency in funding on projects has normally been the root cause of many other problems on projects.

At the same time, funding risks have been identified as having the largest magnitude of impact on road projects.

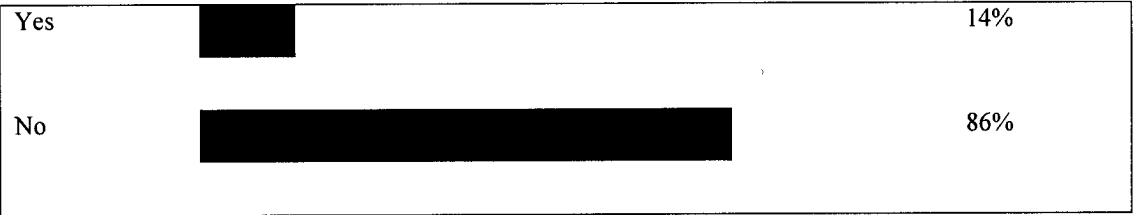
**5.5.3 Risk register or database**

The respondents were requested to state whether or not their organisations recorded identified risks in a risk register or database.

Only fourteen (14) percent of the respondents gave an affirmative answer, while eighty-six (86) percent said “No”.

From available literature, it is advisable for organisations or project managers to maintain a database or risk register that records the various risks associated with projects so that it can be used as a checklist for future projects. Knowing the type of risks commonly associated with a particular road project is extremely beneficial as

management measures can be planned in advance. Local organisations not maintaining these databases is a serious lapse in project risk management, and may affect the performance of projects. These results are summarised Figure 5.20 below.

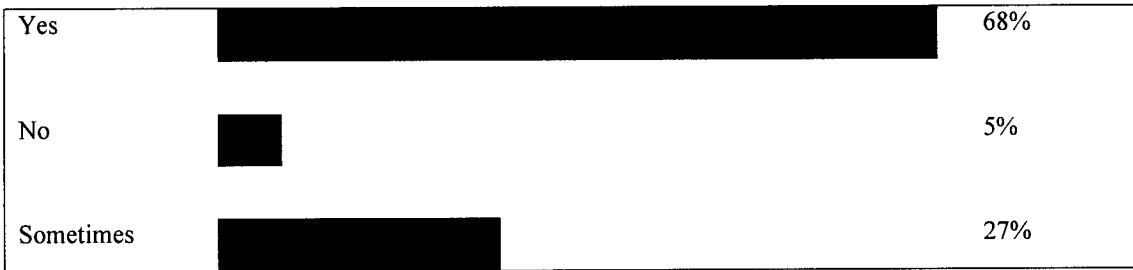


**Figure 5.20:** Does respondent organisation keep risk register or database?

**5.6 Risk assessment and treatment**

**5.6.1 Provision for risk in contracts**

To obtain information on the practice or custom for provision for risks on contracts, respondents were requested to indicate whether the traditional 10% contingency in the contract sum is always provided. From available literature, it was observed that the 10% contingency is mostly provided as part of the contract sum to cater for possible risks. This practice is quite common, although there is no realistic basis for the amount. The responses were as follows. Sixty-eight (68) percent indicated “Yes” the 10% contingency was always provided in their contracts to cater for the potential impact of risks, five (5) percent indicated “No”, while twenty-seven (27) percent indicated that the 10% contingency is “Sometimes” provided in contracts to cater for the potential impact of risks. These results are summarised in Figure 5.21.



**Figure 5.21:** Does your organisation provide 10% contingency in contract documents as a risk management measure?

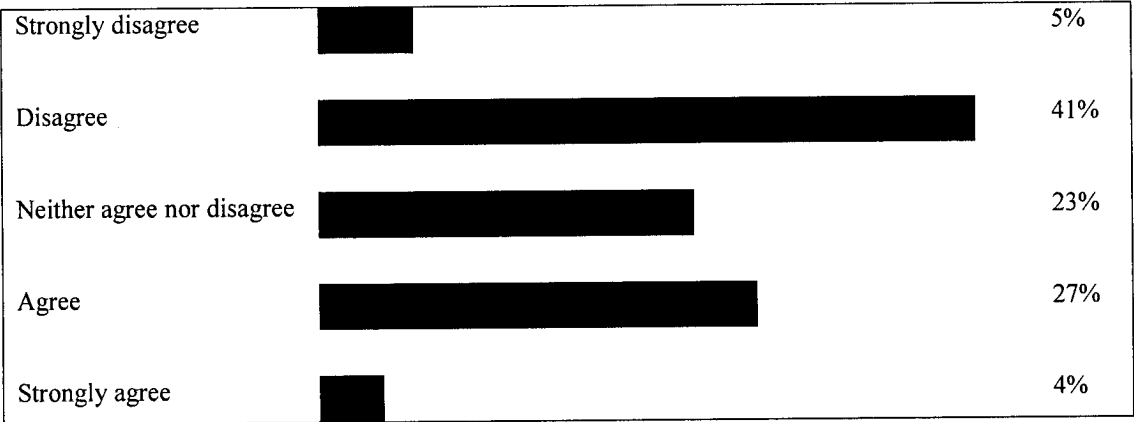
However, from available project information, this 10% is hardly adequate to cater for most risks that projects face, especially that the figure is arbitrary. No reasonable basis or explanation on how the “10%” contingency was arrived at is available. It is thus clear that a lot more than this figure needs to be provided in contracts to cater for risks. Further, a realistic and logical basis for financial provision for risks needs to be developed. It must be based on practical information and experiences, so that the provision caters as comprehensively as possible for possible risks.

**5.7 Risk monitoring and review**

**5.7.1 Effectiveness of risk management controls in place**

Routine risk monitoring and continuous review of the existing risk management controls is essential for effective risk management. Respondents were thus requested to state whether their organisations routinely reviewed the effectiveness of controls in place to manage risks.

Four (4) percent “Strongly agreed”, twenty-seven (27) percent “Agreed”, twenty-three (23) percent “Neither agreed nor disagreed”, forty-one (41) percent “Disagreed”, while five (5) percent “Strongly disagreed” that their organisations routinely reviewed the effectiveness of controls in place to manage risks. This is shown in Figure 5.22.



**Figure 5.22:** Does your organisation review effectiveness of risk management controls?

This result clearly shows that more emphasis should be placed on evaluating and reviewing the effectiveness of the project risk management plans in place if road projects are to be better managed. Literature has shown that risk profiles are continuously changing and thus risk management plans must equally be dynamic to cater for these changes.

## **5.8 General insights**

Finally, respondents were asked to provide any other insights or comments regarding project risk management on Zambian road projects.

The following were the general comments that were made:

- Almost all wholly government financed projects, i.e. those funded from the central treasury, carry serious financial risks. Funding on most of these projects is either absent or when present so erratic that the projects cannot proceed in a meaningful manner.
- Wholly government-financed projects also carry a lot of political and social risks, as political and social interference is high.
- Meaningful and effective risk management on wholly government-funded road projects is almost non-existent due to the poor funding situations. It is difficult to manage schedule and performance risks as almost always, funding is a factor. Because of this, projects are rarely completed on time, and the workmanship is also compromised.
- All players, i.e., financiers, consultants, contractors and implementing agencies should be involved in active risk management. Risks also need to be equitably apportioned among all.
- Risk management on Zambian road projects is not systematic. There is a serious and urgent need for stakeholders in the road sector to develop a risk management framework. Most firms do not have a clearly defined risk management system in place, and thus most people deal with the after effects of the occurrence of risks.
- Formal training in risk management is required for engineers and project managers;
- Some of the usual difficulties that are faced on GRZ projects are contractor inexperience and poor project supervision.



- Tender documents must explicitly require the inclusion of a clear risk management plan from bidders. The incorporation of this document must be part of the evaluation criteria during bid evaluation.
- Appropriate contract models must be used to ensure that risks are clearly apportioned and treatment measures clearly outlined.

Most of these concerns raised by the respondents in this last segment came out clearly in the Literature Review and are a genuine representation of what is occurring in practice in the implementation of road projects in Zambia. Formal risk management seems not to have been taken seriously or is completely absent in certain cases. Instances of poorly implemented or failed projects shall not end until this realisation is upheld. Risks will continue to occur and disrupt project objectives, increasing project cost and duration, and compromising the standard of performance on projects.

Now that all these issues have been churned, the next chapter will look at the formulation of a model that can be used for project risk management on Zambian road projects.

## **5.9 Summary**

In general, the questionnaire survey helped identify some weaknesses or inadequacies in the manner road projects are implemented and managed in Zambia. It was very clear that road projects were faced with immense hurdles in implementation, which often led to difficulties in attaining the project objectives.

It was also very clear that structured risk management has not taken root in the Zambian road sector, despite the ever increasing volume and complexity of projects. Whereas in some cases, respondents showed a good understanding of risk management and indicated the application of the risk management exercise on projects, the picture that largely came out is that there was little appreciation of structured project risk management and there were hardly any policies that required its strictest use on road projects. Further, where some risk management was employed, the process seemed

rather informal and unguided, to an extent that it was up to the project manager to decide how far to go with the process.

In an industry where the environment under which projects are undertaken is ever changing and where challenges are continually increasing, a revolutionary and modern approach in the fashion projects are undertaken is a necessity. Modern day project implementation needs modern day project management, encompassing rigorous risk analysis and assessment.

## **CHAPTER 6:            PROPOSED MODEL FOR RISK MANAGEMENT**

### **6.0     Introduction**

The two survey methods, i.e. the questionnaire survey and the structured interviews, helped gather information pertaining to risks and risk management on road projects in Zambia. The methods helped identify the various practices, perceptions, inadequacies and weaknesses in the manner road projects are implemented sector-wide. The surveys also helped identify the various common risks encountered on projects, and further, the top five (5) risks in terms of frequency of occurrence and severity of impact.

### **6.1     Proposed model for risk management**

The information gathered through the surveys was analysed to provide a basis for proposals to improve and effectively manage risks on projects through the use of a model. In preparing the model for risk management on road projects in Zambia, flow charts were found suitable. Flow charts are easy to understand diagrams showing how steps in a process fit together. This makes them useful tools for communicating how processes work, and for clearly documenting how a particular job is done.

Flow charts can therefore be used to:

- define and analyse processes;
- build a step-by-step picture of the process for analysis, discussion, or communication; and
- define, standardise or find areas for improvement in a process.

After careful consideration and analysis, results from the surveys, which formed the basis for model development, were crystallised into a generic flow chart with the following key steps, which were deemed necessary for effective risk management on road projects.

## **6.2 Process for risk management**

### **6.2.1 Project inception**

The process of the proposed risk management starts with the inception stage of a road project. This is the phase at which the client or owner of a project conceives the project and gives a go-ahead for the project to commence. At this stage, activities such as feasibility studies and preliminary designs are involved.

### **6.2.2 Form risk management team**

From among project staff, a risk management team should be constituted by the Chief Executive Officer, Managing Partner or Managing Director, depending on the structure in an organisation. However, the entire project team should participate in the risk analysis process. The project team should agree on the selected risk management approach; if they cannot agree, however, the project manager is ultimately responsible for determining the appropriate application of plans and controls.

### **6.2.3 Evaluate salient project information**

Prior to the risk analysis meeting, the project manager should provide the risk analysis participants with all available project information. This information should include the project budget, project schedule, comprehensive project scope, project location and surroundings.

### **6.2.4 Screen and identify probable risks**

Screening questions should be used to identify risks and categories of risks. The risk management team may choose to develop a standard screening checklist for efficiency. The result of the process is a comprehensive list of probable risks to the project that the team should focus on.

### **6.2.5 Presence of risks**

If the team determines that there are no potential risks, then the decision to sanction the project can be made immediately. Nonetheless, the project shall be monitored for any risks.

However, positive responses to screening questions, i.e. “Yes” risks are present, would indicate a risk potential that should be further evaluated by the team. This then calls for continuity to the next stage of the process.

#### **6.2.6 Identify assumptions and scenarios**

Generally, risk analysis is performed in a meeting where participants discuss the project scope, risks, and assumptions and brainstorm management or mitigation strategies.

#### **6.2.7 Evaluate and quantify risks**

Risks are quantified (i.e., graded as low, medium, or high) based on the results of the risk analysis meeting and definitions of project scope, schedule, and cost. Each risk and its corresponding assumptions should be recorded on a risk identification and analysis form. Any method chosen for grading a risk should be qualitative as well as quantitative. Though formulae and modelling techniques are useful tools for organising and assessing risks, they do not substitute professional judgment and experience of the project manager and other project team members.

#### **6.2.8 Rank the risks**

A sound methodology for determining whether a risk is low, medium, or high is to combine information about its probability of occurrence (P) and the consequence of the realised risk (C), as described below.

The probability of occurrence is considered for the duration of the project. However, if the probability of occurrence is higher in some project phases than others, the probability of occurrence should be used in the current or next immediate project phase, and the probability of occurrence for the risk should be updated in a subsequent risk analysis. The probability is expressed as a decimal between 0 and 1, where 0 is no probability of occurrence and 1 is 100% probability of occurrence. The probability of occurrence (P) is recorded on a risk identification and analysis form with any other assumptions or basis used for determining the probability.

The consequence of the realised risk is best determined using a consequence table, which permits the team to define the cost and schedule thresholds at which the consequences of the realised risk will result in one of the following outcomes:

- no consequence to cost and schedule;
- small degradation in cost and schedule results;
- some degradation in cost and schedule results;
- significant degradation in desired cost and schedule results; or
- project cost and schedule goals cannot be achieved.

The evaluation should quantify consequences in terms of cost (US Dollar, Zambian Kwacha, etc.) and schedule time units (days, weeks, months).

One of the following three methodologies may be used to combine the probability of occurrence (P) and the consequence of the realised risk (C) as follows:

- Determine the risk factor (RF). This approach yields the most conservative risk grading result; that is, it produces the highest number of risk factors that result in high risks.

$$\text{Risk Factor (RF)} = (P + C) - (P \times C)$$

where:

High risk = RF greater than 0.7

Medium risk = RF between 0.7 and 0.3

Low risk = RF less than 0.3;

- Use a risk grading plotting chart. This is a less conservative methodology; or
- Use purely subjective methods. The team can evaluate the project, determine the risks, and assign a grade based purely on experience and judgment. This methodology may best be used for low to medium value and less complex projects. Other methods can be employed to quantify risk.

Whatever method is used, documentation of the chosen methodology is highly recommended. Documentation creates a record for future use in the event that a later review, revision, or update is performed by a new team.

### **6.2.9 Decision to implement project**

Once risks have been ranked, risk management and mitigation plans shall be developed. The ranked risks, together with the mitigation plans should be recorded in a risk management inventory. It is up to the client or financier of the project to decide whether they intend to proceed with the project or not, given the various risks and consequences identified.

If a decision to go-ahead is given, the project should proceed to the implementation phase, and risk mitigation activities shall be set in motion until project closure. During project implementation, it is advisable to include contractor representatives in risk analysis because the contractor is generally responsible for executing most of the management and mitigation strategies on the project. Contractor representatives might include the contractor's project manager and the site manager.

Following project closure, the risk management process should be evaluated for performance, and where necessary reviewed.

### **6.3 Top five risks on road projects**

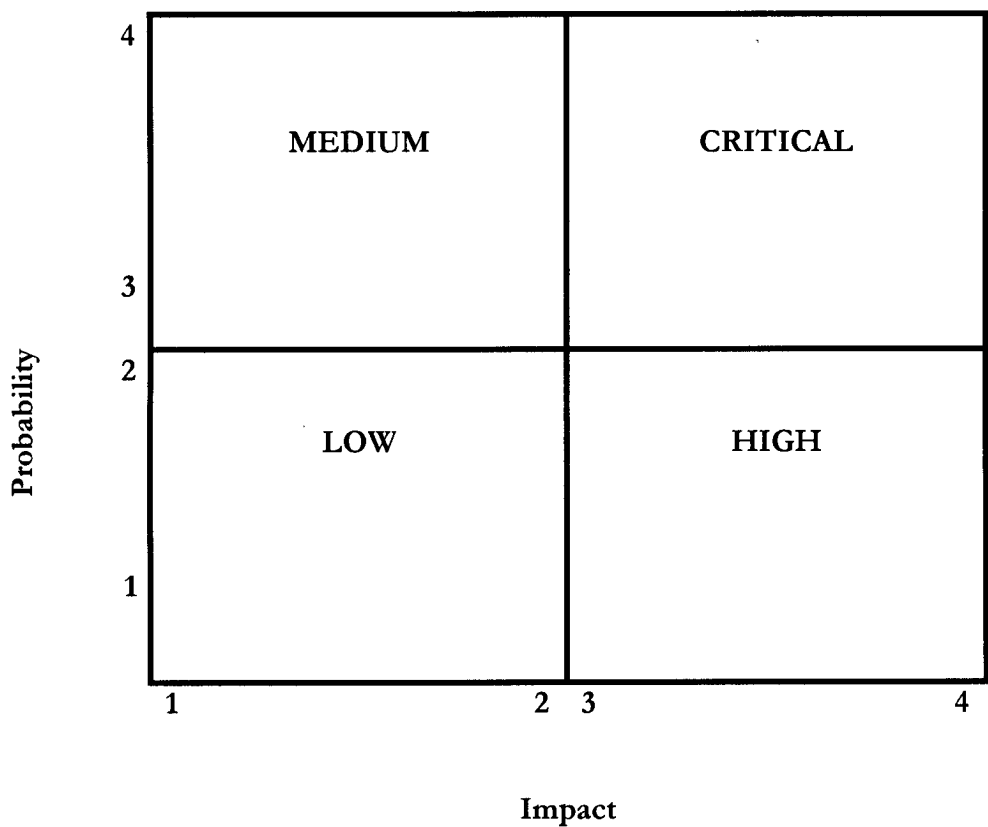
During this study, up to eleven (11) risks were identified as common risks on road projects in Zambia. These were as follows:

- financial risks (poor or inconsistent funding);
- natural hazard risks (climatic conditions, geotechnical conditions, floods);
- poor or incomplete designs;
- political risks;
- shortage of materials risks;
- procurement and contract model risks;
- legal and policy risks;
- difficulty in meeting environmental regulations and requirements;
- labour unrest risks;
- contractor incompetence; and
- poor project supervision.

From the common risks that were identified, five (5) top risks were picked, based on the rating by various stakeholders. These were:

- funding risks;
- natural hazards;
- inadequate designs for works;
- political interference; and
- shortage of materials.

Based on the risk characteristics in terms of probability of occurrence and magnitude of impact, the risks were ranked on a scale of 1 – 4, 1 being the lowest and 4 the highest. On that basis, the risks were termed as “Low”, “Medium” “High” or “Critical”, depending on the combination of their probability of occurrence and impact. The matrix shown in Figure 6.1 was used for the purpose of ranking the risks.



**Figure 6.1:** Risk ranking matrix



Based on the feedback from the study, a sample risk description table indicating, among others, risk ranking, was developed as shown in Table 6.1.

**Table 6.1:** Risk description table

	Risk	Probabil ity	Impact	Risk owner	Project affected	objective
1.	Funding (Critical)	4	4	Client/contractor	Budget, quality	schedule,
2.	Natural hazards (High)	2	4	Client/contractor	Budget, quality	schedule,
3.	Inadequate designs for works (High)	2	4	Client/contractor	Budget, quality	schedule,
4.	Political interference (High)	2	3	Client	Budget, schedule	
5.	Shortage of materials (High)	2	3	Contractor	Budget, schedule	

However, since risks and risk profiles may change, it is advisable to always be alert and use the risk ranking methods described in section 6.2.8 above to rank risks in any risk analysis exercise on a project.

**6.3.1 Funding risks**

Where funding risks are present, i.e. where the team feels that there is a likelihood of funding irregularities, recommendations must be made for an immediate halt to the project, pending the sourcing of adequate funds. Once adequate funds are secured and guaranteed, the project can be re-sanctioned.

**6.3.2 Natural hazard risks**

When risks arising out of natural hazards such as floods or inclement weather are imminent, the risk management team should develop risk management and mitigation plans or measures. These plans should then be recorded in a risk management inventory or database. Finally, all mitigation measures should be implemented and monitored continually until project closure.

### **6.3.3 Design risks**

During design, certain omissions or inadequacies may constitute risks when implementing a project. In cases of inadequate project design, the risk management team should develop risk management and mitigation plans or measures. As before, these measures or action plans must be recorded in a risk management database. These mitigation measures should be implemented and monitored continually until project closure.

### **6.3.4 Political risks**

Political activities or interference may constitute a risk on projects. As required, risk mitigation measures should be put in place and closely monitored throughout the project life.

### **6.3.5 Materials shortage risks**

Materials or input shortages are a likely occurrence on most projects. When this occurs, the risk management team must develop risk management and mitigation plans or measures. Recording the risks and monitoring them as described above are necessary activities.

## **6.4 Validation of the risk management model**

Following the development of the risk management model, the next requirement was to test and validate it with the end-users or stakeholders in the road sector. Validation of the model in this manner is important as the actual end-users or practitioners need to agree with and endorse the idea. Buy-in from the end-users is paramount as people will normally be confident to adopt a concept which has been developed through a consultative and interactive process.

A simple and short questionnaire was thus prepared, specifically focussing on whether the model is useful and easy to understand. Pre-testing was done with three (3) individuals to ensure clarity and easy comprehension by respondents. Comments,

observations and modifications to the questionnaire were proposed by some respondents. These proposals were ultimately included in the final questionnaire.

The questionnaire was divided into two (2) sections: general information on respondent and firm; and insights of the model. A sample of eleven (11) respondents was selected from consultants (4), implementation agencies (3) and contractors (4). This sample size was considered adequate for the purpose. All the administered questionnaires were received. The survey was conducted over a period of one (1) month from November to December 2007. The questionnaires were distributed and collected in person.



A copy of the questionnaire is attached in Appendix C. The results of the validation exercise are discussed in section 6.5

**6.5 Analysis and discussion of the validation questionnaire results**

The data collected was evaluated using both qualitative and quantitative methods. Results of the data analysis formed the basis for finalisation of the risk management model and final adoption.

**6.5.1 General information on respondent and firm**

Preliminary information regarding the positions that the various respondents held in their organisations was requested. This was done in order to establish the level of authority and decision making powers the respondents had. The questionnaire distribution exercise mainly targeted middle and senior management personnel. As mentioned in Chapters 4 and 5, it was established in the research that issues of project risk management were mainly handled by this group of officials in organisations. The results are summarised in Figure 6.2.

Senior management		4
Middle management		7

**Figure 6.2:** Position of respondents in the respective organisations

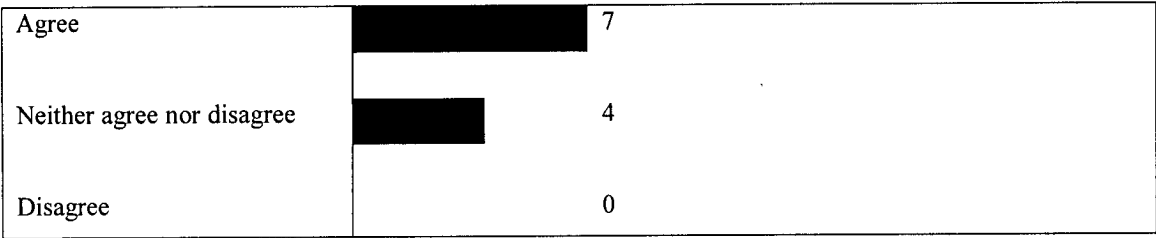
The results revealed that four (4) of the respondents were in senior management while seven (7) were in middle management.

**6.5.2 Validation results**

The sections below describe the results of the validation process.

**a) Extent to which the model addresses steps necessary for managing risks**

The first validation question sought to establish whether the necessary or pertinent steps in managing risks on projects had been thoroughly captured in the model. This was an important aspect to establish, as the content and flow of activities in the risk management process is paramount to the success of the whole process. The results are summarised in Figure 6.3.



**Figure 6.3:** Respondents’ level of agreement with steps in model for managing risks

Seven (7) of the respondents “Agreed” that the model addressed the steps or actions necessary for managing project risks in practice, while four (4) were neither in agreement nor disagreement. As none of the respondents disagreed with the steps, it was taken as a good indicator that the model could be a good start to creating a structured project risk management culture in the Zambian road sector.

**b) Model user friendliness**

The respondents were next requested to state what their views were on the ease with which the proposed steps in the model could be followed and implemented.

The aim of the question was to see whether the steps in the model would be easy to understand, follow and implement on a real project in practice. Sometimes, if not

properly formulated, a proposal or idea may look good on paper, but be problematic to implement in practice owing to various logistical and practical hurdles. The results are summarised in Figure 6.4.

Yes	<div></div>	11
Not sure		0
No		0

**Figure 6.4:** Do you agree that the model is user friendly?

All the respondents agreed that the steps outlined in the model were easy to follow and to implement. This feedback was encouraging and revealed that the proposed steps were pragmatic and logical, and could thus be implemented as long as the will to do so existed.

**c) Usefulness of the model in risk management on projects**

The respondents were asked to state whether they agreed that the steps identified in the model could help in risk management on projects. The results are summarised in Figure 6.5

Agree	<div></div>	10
Neither agree nor disagree	<div></div>	1
Not sure		0



**Figure 6.5:** Respondents’ level of agreement with usefulness of model

Ten (10) out of the eleven (11) respondents felt that the model would help in managing and mitigating the many risks that faced road projects in our country. It was established in literature review that the best way to manage project risks and to improve overall project management was to implement a structured and comprehensive risk management

process. Having a guide or checklist for risk management was thus an inevitable, critical part of any project.

**d) Willingness to employ model on projects**

Having dealt with the content, understanding and usefulness of the model, respondents were asked whether they would be willing to use the model for risk management on their projects. The results are shown in Figure 6.6.

Agree		7
Neither agree nor disagree		4
Not sure		0

**Figure 6.6:** Respondents’ level of agreement with willingness to employ model on projects

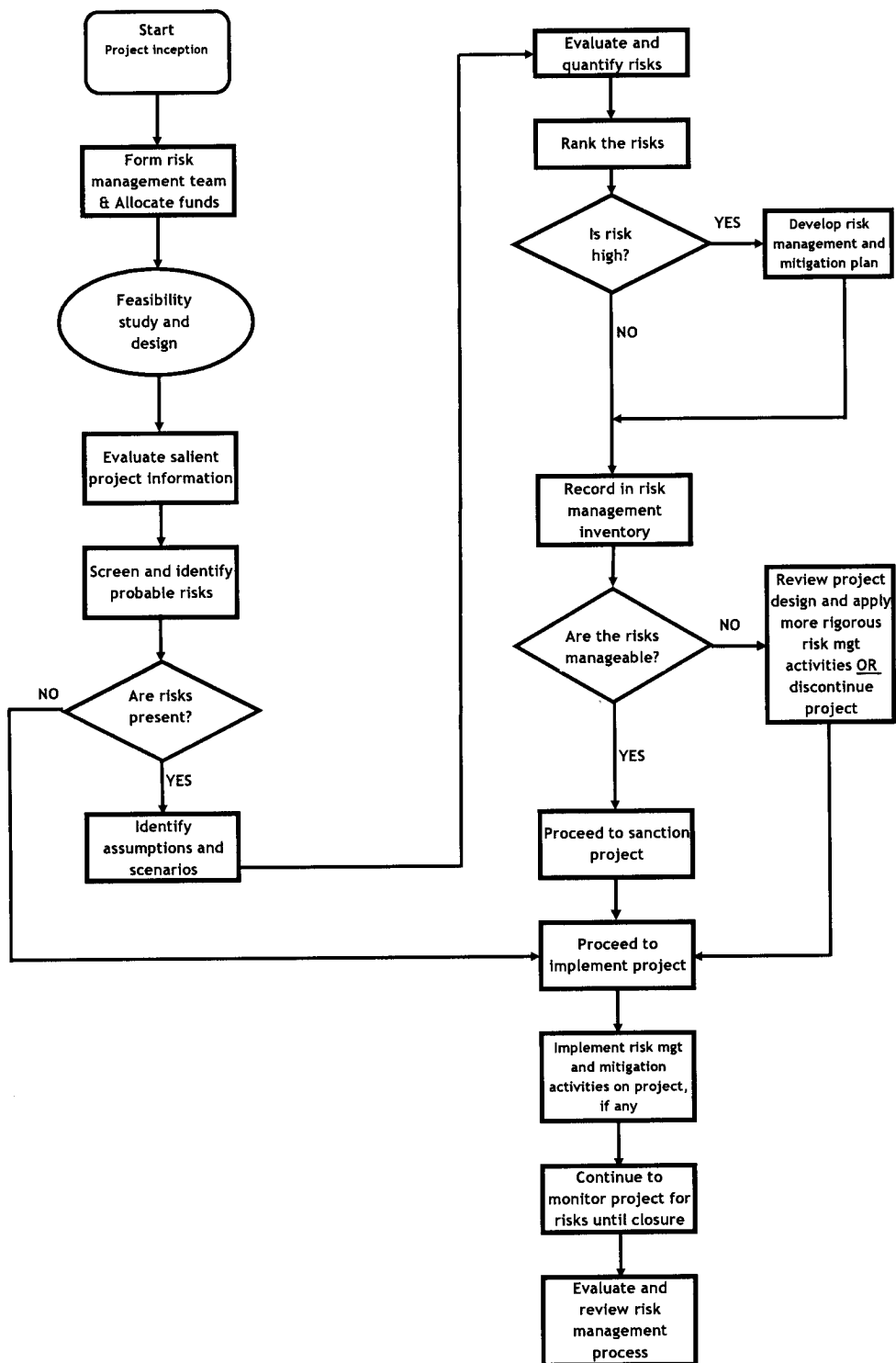
Seven (7) of the respondents indicated that they would be willing to employ the model to manage risks on their projects. Four (4) were neither in agreement nor disagreement. Structured risk management, as established in the field surveys, was critically lacking in the Zambian road sector and projects had been implemented for a long time with this serious deficiency. Realisation was thus needed among the various stakeholders that the use of a structured risk management process is a must and should be an integral part of any project from inception to completion. Therefore, the fact that most of the respondents indicated that they were willing to use the model was thus expected as it provided a remedy for the inadequacy.

**e) Suggestions for improvement to the model**

As an opportunity to give further feedback outside the structured questions, respondents were asked to provide any additions that they deemed necessary to render the model more responsive to the industry’s needs. This was necessary to allow inadequacies or omissions, if any, to be noted and incorporated in a final, more improved model. Suggestions that were received are outlined below:

- in most project proposals and undertakings, project risk management is hardly ever considered especially in Zambia. Comprehensive studies are not undertaken to look at, for example budget constraints, availability of funds to undertake a project, or the competence of the contractor. This results in most projects, especially those funded by the government, being delayed, outstripping the budget or eventually not being completed at all. If proper risk management studies would be conducted on these projects, occurrences such as delayed implementation due to budget constraints would be identified and projects not undertaken altogether;
- in the risk management process, it is better to first “Form risk management team and allocate funds” before the “feasibility study and design” stage is undertaken;
- it is better to use the model back to back with standard conditions of contract such as FIDIC so that an effective combination is achieved. Standard conditions of contract allocate ownership of risks, should they occur, as well as responsibilities obligations therein;
- the cost of risk management and allocation of funds for risks should be a factor that all stakeholders need to be educated about. The cost for risk management and risks should be incorporated in the overall project cost; and
- in the model, instead of discontinuing a project when risks are not manageable, it would be better to provide an option for reviewing the design and implementing more rigorous risk management activities, failing which the project can be discontinued.

These proposals were analysed, and where necessary, used to improve the model. The original model was thus modified by incorporating some of the suggestions, and a final model developed as shown in Figure 6.7.



**Figure 6.7:** Model for managing risks on road projects in Zambia



## **6.6 Summary**

The aim of this chapter was to use the findings and recommendations of the research survey to construct a generic risk management model that may be employed on road projects in Zambia. Various specific experiences and risk factors were identified during the study which assisted in the formulation of the model. Thus, the proposed model was developed as a hybrid of general information from literature and specific information that was gathered in the study.

Having carried out the questionnaire survey for the validation of the risk management model, and given the survey analysis results, it may be concluded that the model was accepted by the stakeholders and may prove useful in providing a structured process that could address the various risk related problems experienced on projects.

A combined use of the risk checklist, the risk description table shown in Table 6.1 and the risk management model can help project managers by providing a database of frequent risks to look out for and the necessary steps to take in managing the risks prior to and during project implementation.

## **CHAPTER 7: CONCLUSION AND RECOMMENDATIONS**

### **7.0 Introduction**

The previous chapter focussed on the development of the risk management model which can be used on road projects in the Zambian road sector. This chapter presents the conclusions of the research, including possible further work and makes recommendations.

### **7.1 Conclusion**

The main aim of this research was to develop a model for management of risks in the implementation of publicly funded road construction contracts in Zambia. Publicly funded projects are projects financed through public resources, which can either be directly from the Zambian Government or from cooperating partners, including any other financing agency whose funds are derived from the public or tax-payers. The biggest risk factor that most road projects experienced was poor or inadequate funding, especially on projects that were fully funded by the Government of the Republic of Zambia. Even on road projects largely funded by donors, but on which government had a ten (10) percent counterpart funding obligation, government had in many instances failed to meet its part.

In developing the model, an investigation of the existing practices in project planning and implementation was vital. It was envisaged that this model would be particularly beneficial to the Zambian road sector when planning and implementing road projects.

Hence, this chapter reviewed the research findings and measured them against the aims and objectives of the research. It also compared the research findings to literature review to establish to what extent the findings corresponded with the general points of view and opinions contained in literature review.

### **7.1.1 Implementation problems on road projects**

Many road projects, especially those wholly funded by the GRZ, face a lot of problems during implementation as far as meeting the project objectives of budget, schedule and quality are concerned. Thus, the main problems on these projects were failure to complete the projects on time, within budget and to the required standard or quality.

Clearly, the prevalence of projects experiencing difficulties was high as witnessed by the surveys. Furthermore, cases of delayed, incomplete or poorly done projects had been identified and cited as a serious problem by many stakeholders in the road sector such as the GRZ and the National Council for Construction (NCC) and various government officials.

It was further established that the critical factors that led to these failures was the poor management of risks.

### **7.1.2 Prevalence of project failure**

It was discovered that there was a considerable number of road projects that failed to meet the triple constraints of time, budget and quality. Some projects, mainly those financed by the GRZ, exhibited a persistent pattern of taking longer than expected, costing more than budgeted and sometimes producing poor quality work.

Due to these impediments, many stakeholders felt that the government had not been getting a return on its investment in road infrastructure. The stakeholders thus called for an urgent need to redress the situation.

### **7.1.3 Risk management practices**

Project risk management was found to be seriously lacking in the implementation of many projects. Structured and documented risk management processes on many projects were almost non-existent. As such, many road projects were conceived and implemented without due regard for a structured risk management process as an integral part of project implementation. In some cases where risk management was applied, it was done

without a proper policy or guidelines, with no real requirement for its use on projects. In such cases, the main instrument which was utilised to allocate and manage risks was the available contract model. Further, insurance bonds or bank guarantees were used to guard against poor performance or desertion of the project by the contractor.

However, these measures alone were not adequate and could not pass as risk management activities, as they merely offered a form of redress after the fact, i.e., after a risk event had already occurred. Proactive and structured risk management would ensure that risks are dealt with well before they occur, and thus save huge costs.

As a result, most projects suffered severe drawbacks during implementation when faced with risk events due to the absence of prior and sustained risk consideration and management.

#### **7.1.4 Critical project risks on road projects in Zambia**

The critical and common risks on Zambia road projects were identified. These were:

- financial risks (poor or inconsistent funding);
- natural hazard risks (inclement weather such as heavy rains, geotechnical conditions, floods);
- poor or incomplete designs;
- political risks;
- shortage of materials risks;
- procurement and contract model risks;
- legal and policy risks;
- difficulty in meeting environmental regulations and requirements;
- labour unrest risks;
- contractor incompetence; and
- poor project supervision.

Further, top five (5) risks established as being the most critical and most prevalent, were as follows:

- funding risks;
- natural hazards;
- inadequate designs for works;
- political interference risks; and
- shortage of materials.

### 7.1.5 Development of the risk inventory and model for risk management

These risks formed the Risk Inventory (RI) for local road projects. The risks, depending on their ranking, had varying degrees of probability of occurrence and magnitude of impact on projects. The five (5) critical risks were assessed and analysed and their characteristics were as tabulated below:

**Table 7.1:** Risk description table

	Risk	Probabil ity	Impact	Risk owner	Project affected	objective
1.	Funding (Critical)	4	4	Client/contractor	Budget, quality	schedule,
2.	Natural hazards (High)	2	4	Client/contractor	Budget, quality	schedule,
3.	Inadequate designs for works (High)	2	4	Client/contractor	Budget, quality	schedule,
4.	Political interference (High)	2	3	Client	Budget, schedule	
5.	Shortage of materials (High)	2	3	Contractor	Budget, schedule	

### 7.2 Survey limitations

A number of problems were encountered while conducting this particular study. During the data collection stage using the questionnaire exercise, many respondents initially seemed hesitant or sceptical about participating in the survey. They seemed unwilling to easily let out information regarding their firms or projects. Thus, some responses may not have been honest, as the respondents chose to give responses that suited them, and not necessarily what was truly obtaining. The same observation was also made during the structured interviews.

Further observations are that the road sector seems averse to such surveys, probably due to the fact that not many surveys are carried out, if any at all. In addition, there were some restrictions in accessing some relevant documents. There is thus need to develop and encourage a culture of research and survey, if genuine and representative results are to be obtained. This way, issues raised in surveys can be more meaningful and thus form a basis for remedial measures, where necessary.

Finally, due to limited time and resources, not all intended road projects were visited and not all pertinent road project documentation was reviewed.

### **7.3 Recommendations**

Given the findings of the research, structured risk management is highly recommended on road projects. This will ensure that projects are comprehensively examined for possible risks and risk management plans developed to handle those risks.

In the literature review, some of the risks above were identified as the biggest risk factors likely to occur on projects. It is thus highly recommended that project managers for road projects in Zambia pay particular attention to the risks so that adequate management and treatment of these risks is attained. Given the current scenario, therefore, structured risk management would provide the solution to poor project implementation and significantly enhance project success and overall project management.

It is also recommended to employ the project risk management model shown in Figure 6.7 in the risk management process on road projects in Zambia. The model does provide a step by step guide on the execution of the exercise and would be a useful tool in addressing the consistent project implementation bottlenecks that especially border on poor risk management.

The results of the study will be useful to Government, its cooperating partners, contractors, consultants and all other stakeholders in the road sector as it provides valuable information on how systematic and efficient project risk analysis and management can improve the administration of road contracts. The findings also justify the need for risk management to form a fundamental part of any road construction project.

In the course of the study, no previously existing publications were identified that specifically dealt with project risk management on Zambian road projects. The research is probably one of the first studies of its kind in the Zambian road sector. Thus, most findings and recommendations in this study may need further development and refinement to make them more reliable and relevant to the industry. As it can be seen, this study focussed mainly on the implementation phase of road projects. The study may be extended to look at procurement and bidding risks to provide more information for refinement of, say, the risk management model to cater for broader project phases. This is an area that requires further research.

## REFERENCES

- Association for Project Managers (APM) (2000) Body of Knowledge (PMBOK) Project Management Fourth Edition, pp 21-22, 4<sup>th</sup> ed. Association for Project Management
- Association for Project Management (APM) (2000) Guide for Project Risk Analysis and Management, Association for Project Management
- Bell J. (1999) Doing Your Research Project, A Guide for first time researchers in education and social sciences, 3<sup>rd</sup> ed. Open University Press
- Ben-david I. and Raz T. (2001) An integrated approach for risk response development in project planning, Journal of the Operational Research Society
- Bryman A. (2001) Social Research Methods, 2<sup>nd</sup> ed. Oxford University Press
- California Department of Transportation (2003) Project Risk Management Handbook, 1<sup>st</sup> ed. Office of Project Management Process Improvement
- Chege L. and Rwelamila P.D. (2002) Risk management and procurement systems – an imperative approach, Division of Building and Construction Technology, CSIR
- Choi H., Cho H. and Seo J.W. (2004) Risk Assessment Methodology for Underground Construction Projects, Journal of Construction Engineering and Management Vol. 130, No. 2
- Cohen L., Manion L. and Morrison K. (2000) Research Methods in Education, 5th ed. RoutledgePalmer
- Coppendale J. (1995) Manage risk in product and process development and avoid unpleasant surprises, IEE Engineering Management Journal, No 2, pp 35-38



- Ernesto H. and Jean-Marie L. (2000) Trends in Contracting Practice for Civil Works, p 1
- Hague P. (2002) A white paper on: How to get information for next to nothing, B2B International
- Hall D. and Hullet D. (2002) Universal Risk Project Final Report, pp 6-8
- Jannadi O. and Almishari S. (2003) Risk Assessment in Construction, Journal of Construction Engineering and Management, Vol. 129, No. 5
- Leopoulos V., Kirytopoulos K. and Malandrakis C. (2003) An applicable methodology for strategic risk management during the bidding process, International Journal of Risk Assessment, Vol. 4, No. 1, pp. 67-80
- McCallum H. M. (2000) A Quick Primer On Construction Risks and Contracting Practices, Associated General Contractors of America
- Method 123 Limited (2003) Risk Management Process, METHOD 123
- Nasir D., McCabe B. and Hartono L. (2003) Evaluating Risk in Construction – Schedule Model: Construction Schedule Risk Model, Journal of Construction Engineering Management, Vol. 129, No. 5
- National Council for Construction (2000) Construction News Vol. 1, No. 11&12 November/December p 1
- National Council for Construction (2001) Construction News Vol. 2, No. 9 September, p 1
- National Council for Construction (2004) Construction News Vol. 5, No. 4 April, p 3

National Task Force (2003) RoadSIP II Bankable Document, Fifth Final Draft, p xii,  
Government of the Republic of Zambia  
Public Roads Act No. 12 of 2002 Part II Section 4 (1), (2)(a)

Queensland Government Department of Main Roads (2004) Project Manager's Risk  
Management Guidelines, Version No. 2, pp 6-10, Department of Main Roads

Roads Department (2002) Quarterly Projects Progress Report (Fourth Quarter), Roads  
Department, Ministry of Works and Supply

Roads Development Agency (2005) Quarterly Projects Progress Report (First Quarter),  
Roads Development Agency, Ministry of Works and Supply

Sato Y., Kitazume K., Kazuaki and Miyamoto K. (2005) Quantitative Risk Analysis of  
Road Projects Based on Empirical Data in Japan, Journal of the Eastern Asia Society for  
Transportation Studies, Vol. 6, pp. 3971 - 3984

Syed A. M., Salman A. and Irtishad A. (2001) Evaluation of Florida General  
Contractors' Risk Management Practices, Florida International University

The Post Newspaper (2005), No. 3009 January 12

The Post Newspaper (2005), No. 3018 January 21

The Sunday Post (2005), No. 3020SU164 January 23

The Post Newspaper (2005), No. 3051 February 23

Thompson P.A. and Perry J.G. (1992) Guide to Project Risk Analysis and Assessment,  
Implications for Project Clients and Project Managers, Thomas Telford

Warszawski A. and Rafael S. (2004) Practical Multifactor Approach to Evaluating Risk of Investment in Engineering Projects, Journal of Construction Engineering and Management, Vol. 130, No. 3

# **Appendix A:**

# **Structured Interviews**

# **Guide**

## **Section A: General information on interviewee and firm**

1. Name of organisation: .....
2. Type of organisation: .....
3. Position of interviewee: .....
4. Interviewee's years of experience in road sector: .....

## **Section B: Brief overview of projects**

1. How many road projects have you been involved with in the last 5 years?
2. What is the range of contract values for these projects?
3. How many of those projects cost more than the original budget?
  - i) Negligible
  - ii) Quite a few
  - iii) Many
4. How many of those projects took longer than originally scheduled to complete?
  - i) Negligible
  - ii) Quite a few
  - iii) Many
5. On how many of those projects were the works of poor quality or not up to standard?
  - i) Negligible
  - ii) Quite a few
  - iii) Many
6. Are you aware of any projects that have been abandoned or have failed?
7. What factors do you think contribute to these projects failing to meet the desired objectives of cost, duration and quality requirements?
  - i) Contractor's incompetence?
  - ii) Design inadequacy?
  - iii) Poor project supervision?
8. What other factors do you think contribute to these projects failing to meet the desired objectives of cost, duration and quality requirements?
9. Have there been disputes or legal suits on any of your projects due to occurrence of unexpected adverse events?
10. If so, how were these disputes resolved?
11. What was the effect of these disputes on the project?
12. In your opinion, how would you rate the prevalence of failure by some road projects to meet the budgetary, schedule and design requirements?
  - i) Low
  - ii) Medium
  - iii) High

## **Section C: Existing risk management practices**

1. How is risk managed on projects in your organisation?
2. Do you have a well documented and established risk management process in your organisation?
3. If a process exists, how long has it been in place?
4. If a process exists, is there a company policy that requires its use?
5. Who is responsible for risk management?
6. Do you apply the project risk management process at all stages of a project?
7. Do you think formal risk management can improve the performance of projects?

## **Section D: Risk management process**

### **Risk identification and assessment**

1. What tools or process do you utilise to identify project risks?
2. What sources of information or data do you use to assess risks before undertaking projects?
3. Do you analyse funding risks before implementing a project?
4. Do you assess natural risks before undertaking a project?
5. Do you consider design flaw risks before undertaking a project?
6. Which of the following risks are most likely to occur on projects (tick all that apply)?
  - i) Political risks
  - ii) Natural hazard risks such as climatic conditions, geotechnical conditions, earthquakes, bushfires and floods
  - iii) Difficulty in meeting environmental regulations and requirements
  - iv) Poor or incomplete designs
  - v) Procurement and contract model risks
  - vi) Legal and policy risks
  - vii) Funding risks such as poor or inconsistent funding
  - viii) Foreign exchange rate instability
  - ix) Input or material price escalations
  - x) Shortage of materials
  - xi) Labour unrest risks
  - xii) Contractor inexperience or incompetence
7. State any other risks that are not listed above.
8. Are these risks above common to all projects or does each project have its own unique risks?
9. What would you consider the 5 key or most critical risk factors related to projects (rank in order of significance where 1 denotes the most critical risk while 5 denotes the least critical)?

**Risk treatment**

- 1. How would you deal with occurrence of risks on projects during implementation? Do you:
  - i) add money?
  - ii) add time?
  - iii) change the design standards or specifications?
- 2. If money is added to the project cost to cater for risks, what percentage is added?
- 3. Does the percentage vary from project to project or is it standard?
- 4. When risks occur on the project, does the sum provided adequately cater for the risks?
- 5. What actions, if any, have been taken to revise the percentage to make it adequate?
- 6. What other form of provision for risk exists?
- 7. How would you rank your organisation’s risk management?
  - i) Poor
  - ii) Good
  - iii) Excellent
- 8. Would you be willing to allocate funds to support risk management?
- 9. General insights:

If you have any other insights or comments to make on risk analysis and management on road projects in Zambia, please state these in the space provided:

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

**End of interview.**

**Thank you for your time.**

# **Appendix B:**

## **Questionnaire on Risk Management Practices**



To select a response or responses, kindly circle the numbers or tick in the box provided. Some questions require that you provide a written statement.

Section 1: Profile of respondent

Contact details:

<b>Organisation:</b>
<b>Phone number (landline and mobile):</b>
<b>E-mail address:</b>

- 1.1

What is your current position in the organisation?

Junior Management

Middle Management

Senior Management

1

2

3
- 1.2

How many years have you been in employment with the organisation?

Less than three

Between three and six

Between six and ten

More than ten

1

2

3

4
- 1.3

How many years of experience do you have with road projects?

Less than five

Between five and ten

More than ten

1

2

3
- 1.4

How many projects have you managed?

Less than ten

Between ten and twenty

More than twenty

1

2

3
- 1.5

What is your highest level of education?

Diploma

Degree

Masters

Doctorate

1

2

3

4
- 1.6

Do you have any formal training on risk management?

Yes

No

1

2

Section 2: Profile of organisation

- 2.1

What type of entity is your organisation?

Contractor

Consultant

Implementing agency

Financier

1

2

3

4
- 2.2

How many years has it been in existence?

Less than five

Between five and ten

More than ten

1

2

3
- 2.3

How many road projects has your organisation been involved with since inception?

Less than five

Between five and ten

Between ten and twenty

More than twenty

1

2

3

4
- 2.4

What type of projects does your organisation undertake?

Building only

Roads only

Building and roads

1

2

3

**Section 3: Overview of projects implemented**

- 3.1

How many road projects has your organisation undertaken in the last 5 years?

Less than ten

Between ten and twenty

More than twenty

1

2

3
- 3.2

How many road projects have not been completed within budget?

None

Very few

Quite a few

Many

Very many

1

2

3

4

5
- 3.3

How many road projects have not been completed within schedule?

None

Very few

Quite a few

Many

Very many

1

2

3

4

5
- 3.4

How many road projects have failed to meet the required standard or design?

None

Very few

Quite a few

Many

Very many

1

2

3

4

5
- 3.5

What factors contributed to projects failure to meet objectives of schedule, budget and quality?  
(please list)
- 3.6

Poorly managed risks have led to disputes or legal suits on projects

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

1

2

3

4

5
- 3.7

Your organisation is willing to allocate funds to support the project risk management function in your organisation

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

1

2

3

4

5

**Section 4: Risk analysis and management**

- 4.1

Understanding project risk management
- 4.1.1

There is a common understanding of project risk management in the organisation

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

1

2

3

4

5
- 4.1.2

Project risk management procedures and processes are documented and provide guidance to staff about managing risks

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

1

2

3

4

5
- 4.1.3

The responsibility for project risk management is clearly set out and understood throughout the organisation

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

1

2

3

4

5
- 4.1.4

Managing project risk is important to the performance and success of road projects

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

1

2

3

4

5
- 4.1.5

The organisation uses risk management tool kit or software for its risk management

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

1

2

3

4

5

**4.2 Risk identification**

4.2.1 The presence and significance of risks is recognised on road projects

<b>Strongly disagree</b>	<b>Disagree</b>	<b>Neither agree nor disagree</b>	<b>Agree</b>	<b>Strongly agree</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>

4.2.2 The organisation identifies the main potential risks relating to each of the project objectives (i.e., completion to cost, time and specification)

<b>Strongly disagree</b>	<b>Disagree</b>	<b>Neither agree nor disagree</b>	<b>Agree</b>	<b>Strongly agree</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>

4.2.3 What type of risks does the organisation identify? (Please tick all that apply)

- ☐ Political risks
- ☐ Natural hazard risks (climatic conditions, earthquakes, bushfires, floods)
- ☐ Difficulty in meeting environmental regulations and requirements
- ☐ Poor or incomplete designs
- ☐ Procurement and contract model risks
- ☐ Legal and policy risks
- ☐ Financial risks (poor or inconsistent funding)
- ☐ Shortage of materials risks
- ☐ Labour unrest risks
- ☐ Other  
(please specify):  
.....  
.....
- ☐ None of the above

4.2.4 List the top 5 risks in 4.2.3 above in order of likelihood of occurrence on a project (1 denotes highest likelihood while 5 denotes lowest likelihood).

- 1) .....
- 2) .....
- 3) .....
- 4) .....
- 5) .....

4.2.5 List the top 5 risks in 4.2.3 above in order of magnitude of impact on a project (1 denotes highest magnitude of impact while 5 denotes lowest magnitude).

- 1) .....
- 2) .....
- 3) .....
- 4) .....
- 5) .....

- 4.2.6 Does your organisation identify risks in terms of (Please tick all that apply)
- ☐ What can happen?
  - ☐ How risks arise?
  - ☐ Why risks arise?
  - ☐ Probability of occurrence?
  - ☐ Area of impact?
  - ☐ Magnitude of impact?
  - ☐ The source of the risk?
  - ☐ Other  
(please specify):  
.....  
.....
  - ☐ None of the above
- 4.2.7 Who is responsible for identifying the risks facing your organisation? (Please tick all that apply)
- ☐ Chief Executive Officer
  - ☐ Risk Management Team
  - ☐ Risk Manager
  - ☐ Line Managers
  - ☐ All Staff
  - ☐ Other  
(please specify):  
.....  
.....
  - ☐ No one
- 4.2.8 The organisation records the risks it has identified in a risk register or database
- | Yes | No |
|-----|----|
| 1   | 2  |
- 4.2.9 If the risk register or database exists, it records (Please tick all that apply)
- ☐ Source
  - ☐ Nature
  - ☐ Existing controls
  - ☐ Consequences and likelihood
  - ☐ Initial risk rating
  - ☐ Other  
(please specify):  
.....  
.....
  - ☐ None of the above

**4.3 Risk assessment and treatment**

- 4.3.1 The organisation finds it difficult to prioritise the main risks on a project  
**Strongly disagree**      **Disagree**      **Neither agree nor disagree**      **Agree**      **Strongly agree**  
**1**      **2**      **3**      **4**      **5**
- 4.3.2 The organisation finds it difficult to assess the likelihood of risks occurring  
**Strongly disagree**      **Disagree**      **Neither agree nor disagree**      **Agree**      **Strongly agree**  
**1**      **2**      **3**      **4**      **5**
- 4.3.3 The organisation finds it difficult to assess the potential impacts of risks  
**Strongly disagree**      **Disagree**      **Neither agree nor disagree**      **Agree**      **Strongly agree**  
**1**      **2**      **3**      **4**      **5**
- 4.3.4 Does the organisation provide the traditional 10% contingency to cater for the potential impacts of risks  
**Yes**      **No**      **Sometimes**  
**1**      **2**      **3**
- 4.3.5 The traditional 10% contingency is adequate for addressing project risks  
**Strongly disagree**      **Disagree**      **Neither agree nor disagree**      **Agree**      **Strongly agree**  
**1**      **2**      **3**      **4**      **5**
- 4.3.6 The organisation measures project risks in terms of (Please tick all that apply)  
☐ Financial impact  
☐ Delay on the project  
☐ Reputation impact  
☐ Likelihood of occurrence  
☐ Failure to meet design requirements  
☐ Other  
(please specify):  
.....  
.....  
☐ None of the above
- 4.3.7 From your knowledge, risk analysis and management is applied at all stages on road projects (i.e. feasibility study, sanctioning, procurement, design and implementation)  
**Strongly disagree**      **Disagree**      **Neither agree nor disagree**      **Agree**      **Strongly agree**  
**1**      **2**      **3**      **4**      **5**
- 4.3.8 Who is responsible for analysing and prioritising the risks facing your organisation? (Please tick all that apply)  
☐ The Chief Executive Officer  
☐ The Risk Management Team  
☐ The Risk Manager  
☐ Line managers  
☐ All staff  
☐ Other

(please specify):  
.....  
.....

☐None of the above

4.3.9 The following is true regarding risks that your organisation faces: (Please tick all that apply)

- ☐It is difficult to assess risks in terms of occurrence likelihood
- ☐It is difficult to assess risks in terms of potential impacts
- ☐It is difficult to develop and review risk mitigation strategies
- ☐It is difficult to monitor risks
- ☐Don't know
- ☐None of the above

4.3.10 Your organisation's response to analysed risks includes (Please tick all that apply)

- ☐An evaluation of the effectiveness of existing controls and risk management responses
- ☐An assessment of the costs and benefits of addressing risks
- ☐Action plans for implementing decisions about identified risks
- ☐Prioritising of risks and selecting those that need active management
- ☐None of the above

**4.4 Risk monitoring and review**

- 4.4.1

The organisation records project risks and refers to this list for future decision-making

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

1

2

3

4

5
- 4.4.2

The organisation monitors and reviews the risks in the achievement of project objectives

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

1

2

3

4

5
- 4.4.3

The organisation has procedures for reporting risks

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

1

2

3

4

5
- 4.4.4

Changes to project risks are identified, assessed and reported on an ongoing basis as to their impact on project objectives

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

1

2

3

4

5
- 4.4.5

The organisation finds it difficult to monitor changes in the profile of risks on projects

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

1

2

3

4

5
- 4.4.6

This organisation routinely reviews the effectiveness of the controls in place to manage risks

Strongly disagree

Disagree

Neither agree nor disagree

Agree

Strongly agree

1

2

3

4

5
- 4.4.7

Monitoring the effectiveness of risk management is an integral part of routine management reporting processes

	Strongly disagree 1	Disagree 2	Neither agree nor disagree 3	Agree 4	Strongly agree 5
4.4.8	Project Managers in the organisation understand the risks faced by various projects which they are responsible for managing				
	Strongly disagree 1	Disagree 2	Neither agree nor disagree 3	Agree 4	Strongly agree 5
4.4.9	The importance of risk management and control has been communicated throughout the organisation				
	Strongly disagree 1	Disagree 2	Neither agree nor disagree 3	Agree 4	Strongly agree 5
4.4.10	The organisation's executive management regularly reviews the performance of all projects in managing risks				
	Strongly disagree 1	Disagree 2	Neither agree nor disagree 3	Agree 4	Strongly agree 5
4.4.11	The organisation has assessed the need for the use of internal capability for monitoring and reviewing of risks				
	Strongly disagree 1	Disagree 2	Neither agree nor disagree 3	Agree 4	Strongly agree 5

4.5 General insights

If you have any other insights or comments to make on risk analysis and management on road projects in Zambia, please state these in the space provided:

.....

.....

.....

.....

.....

.....

.....

.....

.....

The End

Thank you for your time

# **Appendix C:**

## **Model validation**

### **questionnaire**



Kanyuka Mumba  
P.O. Box 31118  
Lusaka.

31<sup>st</sup> October 2007.

Dear Sir/Madam,

**RE: Questionnaire survey – project risk management model validation.**

I am concluding a study pertaining to risk management on road projects in Zambia. I write to kindly request that you complete the questionnaire meant for validation of the attached model. The model was developed through inputs gathered from various stakeholders in the Zambian road sector in a survey conducted from October 2006 to January 2007.

There are two (2) sections in the questionnaire:

1. General information on respondent and firm
2. Insights of the Model

The questionnaire should take a maximum of **10 minutes** to complete. All information presented in this questionnaire will be treated with utmost confidentiality.

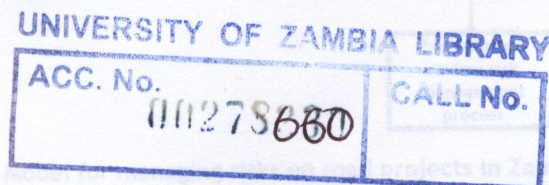
I will be most grateful if you could find the time to complete the questionnaire by .....2007. Your support in this exercise will be highly appreciated. If you are interested, the findings of the survey can be made available to you. Should you have any queries concerning the questionnaire, kindly contact me on:

**Phone: 257259 or mobile 097 8 980034**

**Email: mumbak@zamtel.zm**

Your assistance in this exercise will be of great value and highly appreciated.

Yours faithfully,



**Kanyuka Mumba**  
**MEng Research Student**  
**Department of Civil and Environmental Engineering**  
**University of Zambia.**

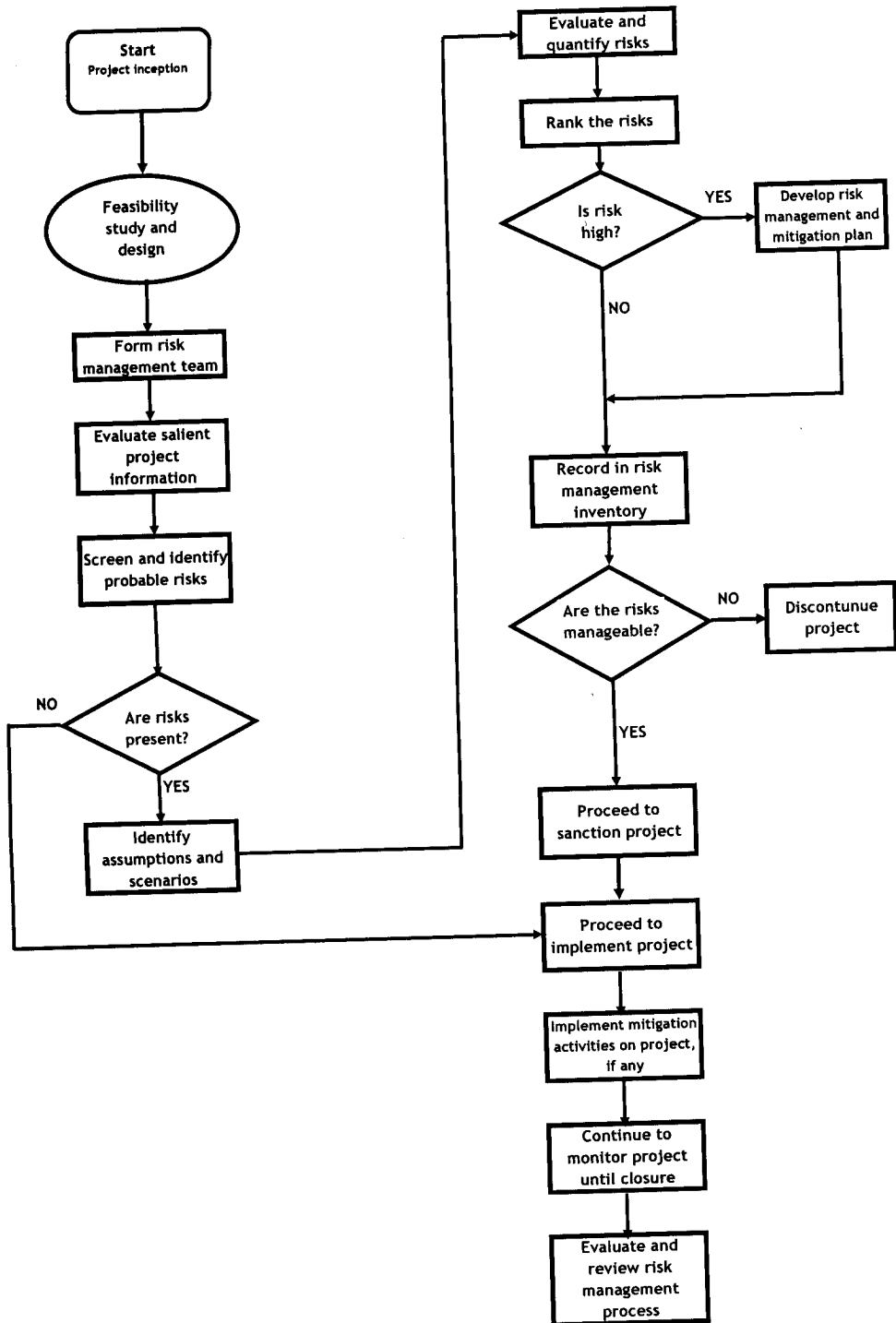


Figure 1: Model for managing risks on road projects in Zambia

**Section A: General information on respondent and firm**

- 1. Name of organisation: .....
- 2. Type of organisation: .....
- 3. Position of respondent: .....
- 4. Respondent's years of experience in road sector: .....

**Section B: Insights of the Model**

- 1. This model addresses the steps or actions necessary for managing project risks in practice?  

<b>Agree</b>	<b>Neither agree nor disagree</b>	<b>Disagree</b>
<b>1</b>	<b>2</b>	<b>3</b>
- 2. Do you think the proposed steps are easy to follow and implement?  

<b>Yes</b>	<b>Not sure</b>	<b>No</b>
<b>1</b>	<b>2</b>	<b>3</b>
- 3. Do you agree that the steps identified in the model can help in risk management on projects?  

<b>Yes</b>	<b>Not sure</b>	<b>No</b>
<b>1</b>	<b>2</b>	<b>3</b>
- 4. Would you be willing to use the model for risk management on your projects?  

<b>Yes</b>	<b>Not sure</b>	<b>No</b>
<b>1</b>	<b>2</b>	<b>3</b>
- 5. Do you have any additions to make that would render the model more responsive to industry's needs?  
.....  
.....  
.....  
.....  
.....  
.....