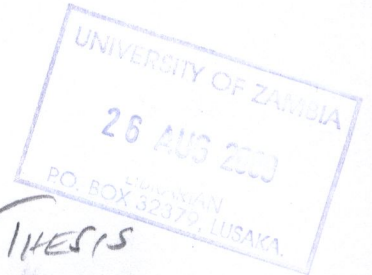


THE NEED FOR TECHNICAL AUDITING IN THE ZAMBIAN CONSTRUCTION INDUSTRY

By

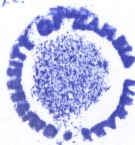
BALIMU MWIYA



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2009
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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
Lusaka



2009



DECLARATION

I, **Balimu Mwiya**, do declare that this dissertation is entirely my own except as specified in acknowledgements and that neither the dissertation nor the original work contained therein has been submitted to this or any other institution for a higher degree.

Signed: *Balimu Mwiya*

Date: *27-07-09*

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Lusaka, Zambia

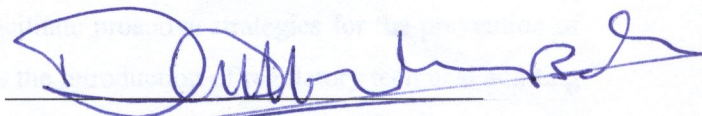
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APPROVAL

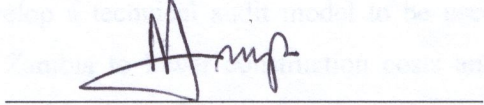
ABSTRACT

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

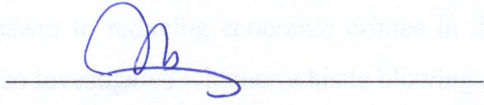
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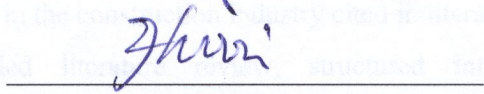
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ABSTRACT

The scale of corruption is magnified by the size and scope of the construction sector, estimated globally at US\$3,200 billion per year (Transparency International, 2005). As economic crimes such as fraud, bid-rigging, bribery, collusion, coercion and extortion have grown worldwide, so has the fight against them taken centre stage. The construction industry being a multi-billion dollar complex industry makes it a suitable breeding ground for these economic crimes that have remained an impediment to development. To uphold the high ethical standards required in the industry, stakeholders need to introduce and facilitate proactive strategies for the prevention of economic crimes. One such strategy is the introduction of regulatory technical auditing on construction projects. Technical auditing is currently not contractually recognized in any form of contract used in the *Zambian construction industry*.

The aim of the research was to develop a technical audit model to be used in the auditing of construction projects in *Zambia* to lower construction costs and tackle unethical practices in the industry. The objectives of the study were to investigate the nature and form of economic crimes in the *Zambian construction industry* and establish whether existing institutions had the capacity to expose and prevent such criminal activities. The study further examined the benefits of technical auditing, and whether technical audits were the answer to reducing economic crimes in *Zambia's construction industry*. The research also investigated whether whistle blowing systems, contractor blacklisting and deregistration of consultants from their professional bodies were adequate deterrents of corrupt practices.

To investigate the unethical practices in the construction industry cited in literature, the data collection techniques included literature review, structured interviews, questionnaire surveys and case studies. A best practice technical audit model was developed and validated by industry stakeholders.

The study established that introduction of pro-active technical auditing, through the appointment of technical auditors and incorporation of audits at planning stages of projects, would be an effective measure in uncovering and preventing or minimizing unethical practices in construction. It was further established that the highest ranked benefit of technical auditing was client confidence. Increased client confidence would ensure more investment, ultimately increasing the country's economic activity in the sector.

It is expected that information brought out in this study may be useful in raising awareness of economic crimes, development of prevention strategies and assist in developing necessary policies and guidelines for the introduction of regulatory technical auditing of construction projects in Zambia, and elsewhere.

The study, though, had some limitations that need to be considered when interpreting the reported results. Limitations such as the scarcity of literature on technical auditing in Zambia, the large geographical coverage of Zambia, which was the study area, non-response from the supplier sector and the absence of an internationally accepted definition of economic crime could be cited as weakness in the study. Varying interpretations by respondents could probably have had an influence on the results reported in the paper. However, some of the identified limitations could be addressed through further studies.

Key words: Technical auditing, Economic crimes, Unethical practices, Construction industry, Zambia

DEDICATION

To Wabei, Mwiinga and Maloko

I did this for my sanity. You know what I was going through. Thank you for your support. I love you all.

ACKNOWLEDGEMENTS

A number of people have contributed in various ways to facilitate my dissertation. It is understandable that some of them preferred to remain anonymous. This notwithstanding, I am especially indebted to Dr Mundia Muya who supervised my work thoroughly and efficiently. This dissertation would not have been what it is without the indispensable advice, numerous information, corrections, assistance and mentorship.

Many thanks to the University of Zambia for providing the necessary facilities.

I will always be indebted to my sisters Ms Nalishebo Mwiya and Mrs Luziya Mwambazi for encouraging me and adeptly ensuring that I enrolled in the programme.

Special thanks to Ministry of Science, Technology & Vocational Training for awarding me the 2007 Science and Technology Postgraduate Scholarship which alleviated the financial burden of this study.

I would like to thank Mr J. Daka, Mr H. Kavimba, Mr H.B. Chalwa and other respondents for effectively contributing to the study.

Heartfelt gratitude to Jack for skilfully pushing me in the right direction and making sure I met all my deadlines.

Sincere thanks to the Mwiya clan who spiritually walked this long process with me and managed to make me enjoy it.

Father Chisulo, by sorting out my spiritual life you made this possible. Without Jesus and his Mother Mary, I am nothing but with them I can do all things.

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LIST OF ABBREVIATIONS

ACEZ – Association of Consulting Engineers of Zambia

AGO - Auditor General's Office

BOQ - Bill of Quantities

EIZ - Engineering Institution of Zambia

Eng-RB – Engineers' Registration Board

FIDIC - International Federation of Consulting Engineers

GRZ - Government of the Republic of Zambia

ICE - Institution of Civil Engineers

K - Zambian Kwacha

NCC - National Council for Construction

NFRA - National Road Fund Agency

PHI - Presidential Housing Initiative

RDA - Road Development Agency

SIZ - Surveyors Institute of Zambia

TA - Technical Audit

USA - United States of America

USD - United States Dollar

VAT- Value Added Tax

WB - World Bank

ZABS - Zambia Bureau of Standards

ZIA - Zambia Institute of Architect

ZPPA – Zambia Public Procurement Authority

Chapter One: Introduction

1.1 Background

The construction industry being a multi-billion dollar, complex and diverse industry makes it a favourable breeding ground for economic crimes such as fraud, bid-rigging, bribery, collusion, coercion, misrepresentation of facts and extortion. The construction industry has numerous participants in the process of planning, designing, financing, constructing and operating of physical facilities.

As the fight against economic crimes in the construction industry has taken centre stage worldwide, many organisations have formed task groups to fight these crimes that have proved to be an impediment to development. For example:

- through its Department of Institutional Integrity, the World Bank has investigated cases of alleged economic crimes such as two Lithuanian companies debarred from participation in bank funded projects following accusations of collusion in bidding for a US\$3.28 million contract (Allen, 2006);
- through its publication in April 2007 of the Anti-Corruption Training Manual for the Infrastructure, Construction and Engineering Sectors, Transparency International encourages the construction industry to adopt the Transparency International's Project Anti-Corruption System (PACS) in their contracts (Transparency International, 2007);
- the Secretariat of the FIDIC Group of Africa Member Associations (GAMA), which recently held the 14th GAMA Conference in Gaborone, Botswana in May 2007 whose theme "*Engineering Services, Value for Money*" focused on ways the engineering and construction industry could eliminate economic crimes for the client to obtain value for money (International Federation of Consulting Engineers (FIDIC), 2007);
- the Office of Fair Trading (OFT) in the UK in April 2008, through its indictment, accused 112 construction companies of bid-rigging (Sweet, 2008); and

- the Construction Sector Transparency Initiative (CoST) initiated in Zambia, with the support of the Department for International Development (DFID), covering publicly financed construction projects and whose premise is “*Get What You Pay For*” aims to increase transparency and accountability, consequently improving outcomes and tackling corruption in the construction sector (Andreski, 2007).

1.2 Statement of the problem

As economic crimes have become sophisticated, there is increased realisation that financial auditing alone does not tackle unethical practices that may be prevalent in the construction industry. Therefore, there is need to introduce and implement appropriate strategies that can engender high standards of conduct and ethics. Financial auditing, on its own, may not be adequate to detect and combat economic crimes in construction, hence the need for technical auditing. Regular technical and financial auditing on construction projects could be one way of ensuring that the investment into the sector is worth the cost incurred as suggested by the formula (Petts Consulting, 2003):

$$\text{Technical auditing} + \text{Financial information} = \text{Total confidence}$$

1.3 Rationale

The call for technical auditing comes at a time when there is concern about the overall quality of construction products and that appropriate value is not always received for the money spent.

In Zambia, there is a tendency to audit construction companies and not the construction projects they undertake. These audits are done to satisfy tax compliance and the company’s act requirements. The General Conditions of Contract used in the construction industry in Zambia do not call for a technical audit at any time during the contract.

As a new concept, the unwillingness to accept technical auditing is exacerbated by a general lack of capacity in vital auditing institutions in Zambia. Therefore, establishing technical auditing capacity and procedures would be a challenge. The National Road Fund Agency in Zambia has previously conducted technical audits on some of its projects but most of these were carried out by foreign firms and on donor funded projects. For example, a technical audit of the Chingola-Kasumbalesa Road rehabilitation project was instituted when the original design was varied without approval from the financier, the World Bank. The audit was carried out by Goba (Pty) Ltd, a South African firm (Ministry of Communication and Transport, 2007).

1.4 Aim and objectives of the research

The overall aim of the research was to develop a best practice technical audit model to be used in the auditing of construction projects in Zambia, that could help lower construction costs and tackle unethical practices in the industry.

The aim of the research was achieved through the following objectives:

- investigation of the nature and form of economic crimes in the Zambian construction industry to establish their prevalence and identification of proactive strategies for their prevention;
- analysis of traditional audit guidelines and identification of where they were lacking in highlighting economic crimes in the construction industry;
- a comparative analysis of an audited construction project to establish whether existing institutions had the capacity to expose and prevent such criminal activities;
- analysis of existing deterrents to corrupt practices such as whistle blowing systems, contractor blacklisting and deregistration of consultants from their professional bodies, to determine whether they are adequate; and
- development of a technical audit model to be used in the auditing of construction projects in Zambia.

1.5 Research methodology

Strengths and weaknesses of various research methods were considered before selection of a suitable research design to meet the research objectives. Traditional methods such as literature review, structured interviews, questionnaire survey and case studies were considered, as summarised below.

1.5.1 Literature review

It was apparent that the research focused on a problem that has been investigated before and introduced in several countries. Therefore, literature review included review of relevant books, journals and conference papers with regards to current local and foreign conditions of construction contracts and existing auditing methods. Prevalent unethical practices in the construction industry were also noted from literature. Due to scarcity of literature on technical auditing in Zambia, the internet became the main electronic source for secondary data.

1.5.2 Structured interviews

Primary data was collected through various research instruments such as structured interviews where written down questions were asked to all the interviewees. The interviewees were key players with vast experience in the Zambian construction industry.

1.5.3 Questionnaire surveys

Another research instrument used to collect primary data was a self administered questionnaire. The targeted respondents were representative of all sectors namely: the clientele; consultancy; contractor; manufacturing; and supplier sectors of the Zambian construction industry. Audit firms were included to establish whether they had capacity to carry out technical audits on construction projects.

1.5.4 Case studies

Three case studies were reviewed. The first was from the road sector which was one area that had received substantial investment from government and donors. Singh (2006) stated that high cost investment was a fundamental basis for selection of projects to be subjected to a technical audit. The second case study involved the Presidential Housing Initiative (PHI) to fulfil the requirements of the research whose objective was to use a construction project that had been audited to examine and analyse the findings and recommendations. PHI was audited by the Auditor General's Office and audit findings had been made public. The third case study involved a project financed by the World Bank following World Bank procurement guidelines.

1.5.4 Data analysis

Non-parametric tests were selected and used in the analysis of data. In assessing which unethical practices were more prevalent than others, the frequency of occurrence was computed for ranking purposes. The same was done in the ranking of benefits of technical auditing. Data triangulation was employed and used to qualify phenomena from literature review, survey and case study results.

1.6 Significance of the study

Technical auditing is a relatively new research topic in Zambia and there is little documentation of previous effort of developing a best practice technical audit model for use in the construction industry. The study gives some insights into levels of unethical practices in the construction industry in Zambia, and probably elsewhere, given the amount of attention the subject has received internationally. The study further advocates for pro-active technical auditing as one approach of combating unethical practices in the construction industry in Zambia. There was a perception from the study that individuals were less likely to get involved in unethical practices if there was a chance that such practices could be discovered thus the advocacy for the appointment of technical auditors and commencement of audits at planning stages of construction projects.

The prevalence of economic crimes in construction in Zambia, if unchecked, could stifle the growth of the industry, and consequently the national economy. It could also perpetuate the survival of inefficient and corrupt construction companies. Accountability could be enhanced if perpetrators of economic crimes were punished through blacklisting, de-registration and prosecution. Increased client confidence would ensure improved investment in the industry and ultimately lead to more construction activity in the country.

1.7 Organisation of the dissertation

The dissertation is organised into eight chapters as indicated in Figure 1.1. Each chapter is summarised below.

Chapter one serves as an introduction to the research. The chapter provides the background of the research, statement of the problem, aims and objectives of the study, research methodology and a summary of findings of the research.

Chapter two outlines the review of literature concerning unethical practices in the construction industry, technical auditing and the nature of the construction industry.

Chapter three explores available research methods focusing on their advantages and disadvantages and their adequacy to achieving the specific objectives of the research. Reliable research instruments were then recommended for this study.

Chapter four details how the structured interviews and questionnaire survey were carried out. It further presents data analysis and results.

Chapter five focuses on three case studies, their selection and results. By examining unethical practices from actual experiences and practices of case studies recommendations would be more appropriate to the Zambian scenario.

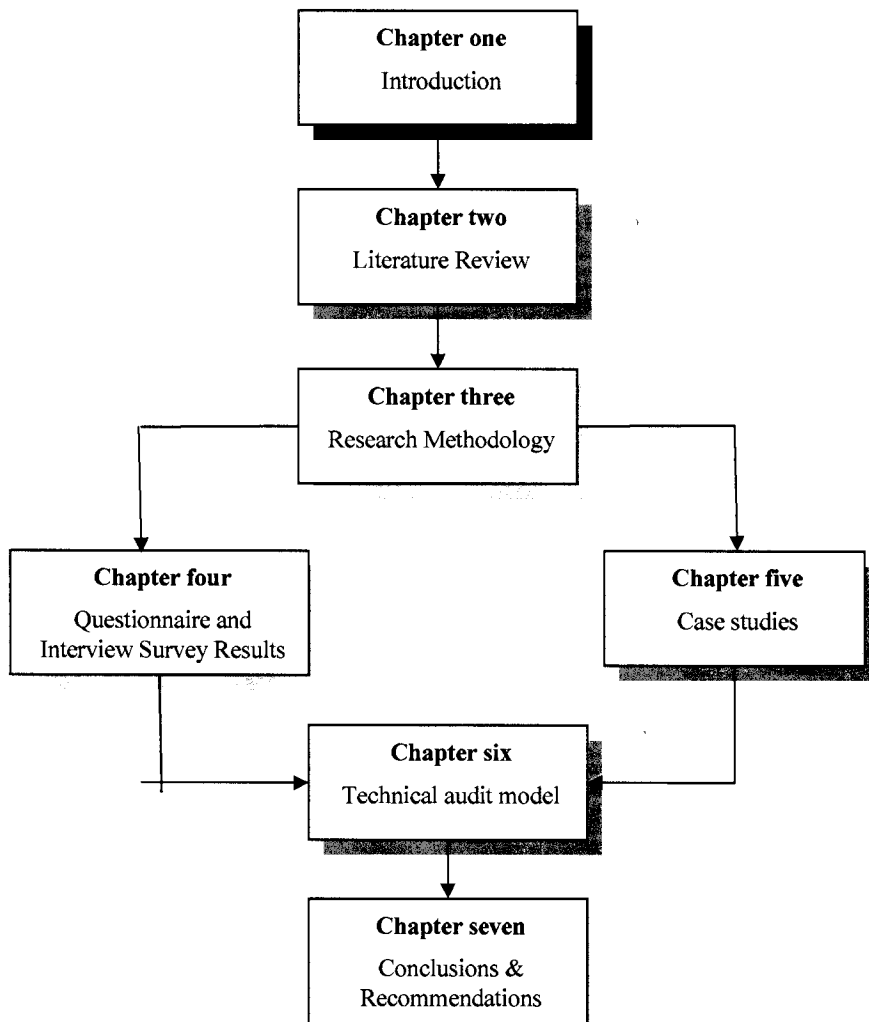


Figure 1.1: Layout of chapters

Chapter six details the development of a technical audit model and its validation for application on construction projects in Zambia. The model incorporates standard checklists to prevent overlooking of any critical aspects in construction thereby reducing fraudulent opportunities that may have adverse financial implications.

Chapter seven presents conclusions and recommendations directed at preventing or minimising economic crimes in the *Zambian* construction industry and elsewhere in the world. Limitations regarding the interpretation of results are also stated.

Chapter Two: Literature review

2.1 Introduction

The previous chapter emphasised the justification of technical audits. By utilizing the findings of peer-reviewed research and studies, this chapter examines the complexity of the construction industry and critically reviews why the construction industry is perceived as having questionable ethical standards. It considers prevalent economic crimes and whether the introduction of mandatory technical auditing would be the right step towards reducing unethical practices in the construction industry. Different types of audits, specifically those related to the construction industry, are described. The chapter also analyses the evolution of the construction industry in Zambia and establishes why technical audits could benefit the industry. Finally, the review tackles the benefits of technical audits to the construction industry. A summary of reviewed literature is presented at the end of the chapter.

2.2 Definition of the construction industry

To appreciate the complexity of the construction industry various definitions were examined.

In the first definition, Dunkeld (2003) indicated that if first year undergraduate students were asked what they understood by construction, nearly always it was the total of the activities that take place on building sites. This definition compared very well with that given by Government statisticians in the UK, who via the Standard Industrial Classification system, defined construction in similar terms. They defined construction as (Dunkeld, 2003):

- the erection and repairing of buildings;
- the laying of sewers, gas or water mains and electricity cables; and
- the hiring of a contractor's plant and scaffolding.

Definitions like the one above completely ignore those organisations that were clearly involved in construction, but were not actually located on site.

In another definition, Hendrickson (2003) stated that construction referred to all types of activities usually associated with the erection and repair of immobile facilities. He stated that construction consists of a large number of firms that perform construction work for others, and has been estimated to be approximately 85 percent of all construction activities. The remaining 15 percent was performed by employers of the facilities, and was referred to as *force-account* construction. This definition is primarily concerned with the facility's life cycle including activities after physical occupation of the facility until disposal. Strictly speaking, the operation and maintenance of a constructed facility until its disposal or replacement is part of the project life cycle but current construction norms exclude activities by the employer after practical completion of a facility.

The third definition of the industry states that construction comprises five sectors: design; assembly; manufacturing; supply and clientele (Government of the Republic of Zambia (GRZ), 1979). This definition includes those organisations that are clearly involved in construction, but are not actually located on site. To include emerging construction professions such as construction lawyers, arbitrators, technical auditors, project managers and construction software engineers, the design sector was referred to as consultancy. It is concerned with employer advice and project monitoring through design, contract documentation and project supervision including statutory bodies such as Local Authorities, Zambia Bureau of Standards (ZBS) which sets the quality and standards of building materials and National Council for Construction (NCC) which regulates the construction industry. The assembly sector is predominantly concerned with site activities and involves the physical erection of facilities by contractors that implement the designs of the consultancy sector. Because of this function, the assembly sector has been referred to as the contractor sector in this dissertation. The manufacturing sector produces building materials, plant and machinery for the

assembly sector. The supply sector is responsible for the importation and supply of building materials, plant and machinery. And finally, the clientele sector represents employers, those that require the services and products of the consultancy and assembly sectors as illustrated in Figure 2.1. Solid arrows in Figure 2.1 denote direct contractual and broken ones represent non-contractual supply relationships with the client.

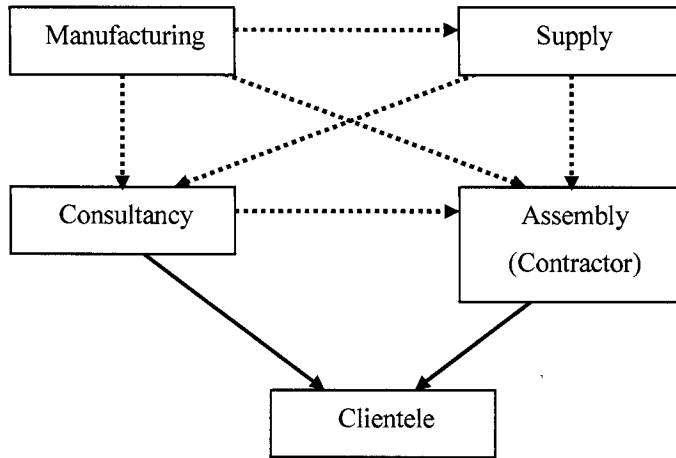


Figure 2.1: A schematic definition of the composition of the construction industry

The above three definitions of the construction industry vary in that the first one just considered construction processes on site, the second included works such as maintenance after practical completion of a project and the last definition included all processes on and off site but up to practical completion of a project. The study adopted the third as the working definition of the construction industry.

2.3 Evolution of the construction industry in Zambia

The history of the construction industry before attainment of political independence of Zambia in 1964 largely remains undocumented. The building materials used to construct chiefs' palaces, traditional huts, grain storage facilities and kraals were freely available and therefore did not require costing.

Formal construction as we know it was introduced to Zambia then known as Northern Rhodesia, after 1890 at the time of the scramble for Africa. The colonialists brought to the colonies their way of living and European settlements were established. Construction activity followed colonial urbanisation which was related to patterns of colonial economic development, especially along the line of rail, which followed the most fertile areas (Vickery, 1986). This is what shaped the urban and rural settings in Zambia. At that time, buildings were relatively simple and construction disputes were unheard of.

At attainment of political independence in 1964, the government had priority projects which were strategically important and needed to be constructed in record time. For instance in the Lusaka International Airport project, the highest bid was accepted because the bidder offered the least construction duration (Elliot, 1971). Government paid a lot of extra money to meet its objectives without even checking on the reasonableness of the tenders submitted. The effect was that large construction activities came too quickly for the Zambian owned construction companies to learn and build capacity. Therefore, by the end of the 1960's, the construction boom dissipated without the establishment of Zambian owned and managed building industry and without having established Zambian substitutes for imported materials.

Following nationalization in the 1970's, expatriate manpower left the country crippling the private sector. Parastatals companies such as Zambia Steel and Building Supplies (ZSBS) controlled the foreign exchange requirements for building materials importation. Scarcity of foreign exchange following the oil crisis in 1975, the fall in copper prices on the world market and the devaluation of the kwacha in 1976 resulted in increased prices of local building materials, further increasing construction costs thus forcing the government to reduce capital works. Government lacked a system to decide which projects to defer or terminate. Technical audits could have formed a basis for such decisions. By the late 1970's, the construction industry was characterized by

lack of growth, limited foreign exchange for material importation, reduced employment and scarce building materials.

In the 1980's, to mitigate the loss of expatriates, government decided to train personnel for the construction industry locally by establishing the School of Environmental Studies in 1981. The impact was not immediate owing to the long term nature of training. In 1985, the government adopted the International Monetary Fund (IMF) stabilisation programme in which the pricing system was decontrolled, subsidies were lifted, interest rates were liberalised and the exchange rate was allowed to find its own level through the auctioning system (Kamya et al., 1988). Reduced credit levels and tight import measures on the construction industry resulted in longer construction periods and increased cost of construction work. On-going construction projects stalled and the skyline of the capital city, Lusaka, and other major cities was dotted with incomplete buildings. Once again technical auditing could have played an important role in highlighting the delays caused by reduced funding and a mitigation plan would have been prepared by the project teams.

The Structural Adjustment Programme (SAP) adopted in the 1990's abolished foreign exchange controls, liberalised trade, interest rates and professional fees. This meant that professionals in the construction industry like architects, quantity surveyors and engineers could negotiate their fees instead of being controlled by the rigid fees structure enshrined in the various Acts such as the Architects and Quantity Surveyors Act (GRZ, 1971). This was meant to enhance activity in the industry and make professional services affordable. But copper prices continued to decline reducing export earnings and foreign exchange reserves. To relieve government from huge losses, the divestiture exercise was implemented where the majority of government owned companies and parastatals were privatised to return them to profitability and spur economic growth.

2.4 The economy and the construction industry in Zambia

From the evolution of the Zambian construction industry, one can observe that at independence, the construction industry was booming but internal economic mismanagement and some external factors that occurred in the 1970s and 1980s triggered the current persistent economic malaise. It is this economic mismanagement that technical audits would have tackled. Despite enjoying peace in the region, Zambia's economy continued to decline, a situation which has partly led to an increase in cases of corruption. The national budget of 2001 showed that the construction industry had only recorded a growth rate of 1.2 percent (NCC, 2001).

The construction sector's share of Zambia's GDP was 10.4 percent in 2007 at constant 1994 prices (Central Statistical Office, 2008). With a population of 11.8 million, and a GDP growth rate of 6.2 percent in 2006, the country is still classified as a Highly Indebted Poor Country (HIPC), an indication of deep social and economic crisis (Jubilee-Zambia, 2001). In 2006, Zambia's Corruption Perception Index (CPI) was 2.6 and remained the same in 2007 (Transparency International, 2007). On a scale of 0 to 10, where 10 is highly clean and 0 is highly corrupt, Zambia is below 3, implying that corruption in the country is very high. For a country that is categorised as least developed, high levels of corruption would act to slow down the rate of economic development and impede government efforts to reduce incidences of poverty. It would, therefore, be necessary to combat incidences of abuse of public funds in the construction and other sectors through appropriate strategies such as regulatory technical auditing.

2.5 Technical auditing

An audit can generally be described as taking stock of things. According to the National Institute of Standards and Technology (NIST), a non-regulatory federal agency within the U.S. Department of Commerce, an audit is an examination or analytical review by an independent organization (NIST, 1997). Internationally, audit conformity is governed by the International Organization for Standardization (ISO).

Audits can either be pre-arranged or unannounced. The various types of audits can generally be classified as internal or external audits. Internal audits are carried out by the auditee organisation while external audits are carried out by an independent firm or individuals arising out of some external factor. The results of external audits, also known as formal audits, may be made available to the general public for scrutiny. Examples of external audits include statutory or compliance audits and operational, performance or technical audits. Chatterji (2001) described a compliance audit as where auditing standards prescribe that internal controls should be studied and evaluated in respect of safeguarding assets and resources when performing regularity and financial audits, and in respect of assisting management in complying with laws and regulations when performing compliance audits. A financial audit is an example of a statutory or compliance audit. It assesses compliance with laws, regulations, and award terms; adequacy of financial systems and internal controls; allowability of costs; and the degree to which a project achieved the intended results (NIST, 1997).

The term 'technical auditing' is used in a number of industry sectors and can have a variety of meanings. Petts Consulting (2003) described technical auditing as an independent, objective assurance and consulting activity designed to assess both the effectiveness and efficiency of an organization's operations. Financial auditing, on its own, may not be adequate to detect and combat economic crimes in construction, hence the need for technical auditing. Regular technical and financial auditing on construction projects could be one way of ensuring that the investment into the sector is worth the cost incurred as suggested by the formula (Petts Consulting, 2003):

$$\text{Technical auditing} + \text{Financial information} = \text{Total confidence}$$

Coupled with detailed financial information, a technical audit assists in understanding an organization's operation, performance, technical and technology base, its risk assessment and opportunities for future improvement. For the construction industry, a technical audit is a formal assessment of the extent to which a project has followed the

procedures laid down in the contract documentation. Detailed areas of consideration in a technical audit include (Singh, 2004):

- land acquisition, usage, conditions and availability;
- reports or studies of environmental impacts, feasibility and costs analysis;
- sources of funds, costs and rate of return for commercial projects;
- project implementation procedures and safeguards, company guidelines;
- professional consultants' agreements and contracts for other services to be outsourced;
- construction contract formats such as those by ZIA, FIDIC;
- statutory requirements, approvals, special conditions and transfer of technology;
- construction supervision and monitoring;
- bid bonds, performance bonds, advance payment guarantees and insurance policies;
- architects instructions and site records;
- contract register and all necessary documentation;
- standards, specifications, changes and delays ;
- interim payments, claims, compensation, advances, interest, penalties and final accounts;
- post construction period aspects such as defects liability period, guarantees and warranties;
- as-built drawings, manuals and certificates of occupation including sectional completion; and
- evaluation of contract implementation including performance of contractors and technical consultants and other appointed professionals.

2.5.1 Background of technical audits

There is a scarcity of published works on the subject of technical auditing. The few companies that are providing this service found a niche in the industry and took advantage of the situation. Projects are becoming bigger and more complex with huge

contract sums. Design teams are getting larger, comprising various specialists. Hendrickson (2003) described the construction industry as a conglomeration of diverse fields and participants that have been loosely lumped together as a sector of the economy. Participants in the process of planning, designing, financing, constructing and operating physical facilities have different perspectives of construction projects. The varying perspectives make construction projects susceptible to unethical practices resulting in waste, excessive cost and delays. Waste, excessive cost and delays can also result from poor coordination and communication among the different actors (Hendrickson, 2003). It is this varying perspective, waste, excessive cost and completion delays that a technical audit is intended to tackle.

2.5.2 Technical audit procedures

A technical audit has its procedures developed through specific task oriented audit tests tailored to the transactions subject to review (Townsend, 2004). For any formal audit to be carried out, objectives, standards and guidelines must be in place to ensure that it can be adopted by various entities and that the audit can be carried out on the same basis. For example, Australia has a road safety audit policy in place (Institute of Public Works Engineering Australia (IPWEA), 2001). This policy is aimed at various councils adopting it. A road safety audit is defined as a formal examination of an existing or future road or traffic project, or any project that interacts with road users, in which independent, qualified examiners look at the project's crash potential and safety performance (IPWEA, 2001). The objectives of a road safety audit are to identify potential safety risks for road users and to ensure that measures to eliminate or reduce the risks are fully considered.

Another example is the Guidelines for Regulatory Auditing of Quality Systems of Medical Device Manufacturers (Global Harmonization Task Force (GHTF), 1999). The GHTF is a group of auditing experts acting on behalf of regulatory bodies and representatives of medical devices manufacturing industries from Australia, Canada, Europe, Japan and the USA. The major objective of these guidelines is to determine

conformance of a manufacturer's quality system with regulatory requirements. Once again this document clearly outlines the objectives, standards and guidelines to be adopted by anyone trying to use this audit policy.

In Zambia, the Minister of Lands announced in 2005 that the ministry would carry out a land audit. Investigations at the Ministry of Lands revealed that there was no formal land audit policy in place. This meant that the objectives of the land audit would vary in each provincial department. It would also be difficult for the local authorities to adopt the Ministry's position to audit land under their jurisdiction. Furthermore, it would be difficult to review the audit because there would be no standards for the review. In this case, what the Minister instructed could be interpreted as just taking stock of what land was available and which areas were vested in the state. It would not constitute a formal audit. Therefore, audit policies are necessary as they streamline the audit process. A typical technical audit process is summarised in Figure 2.2.

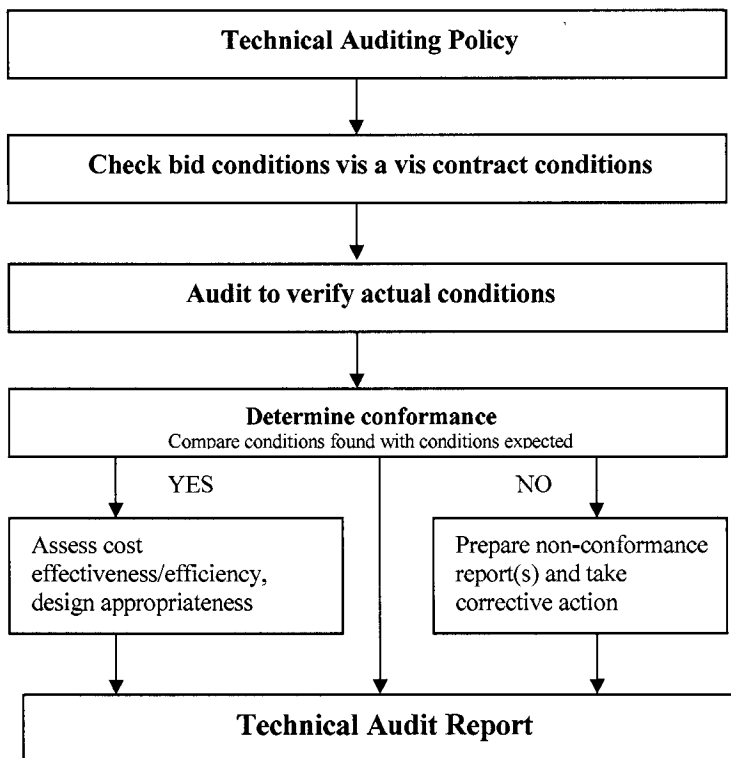


Figure 2.2: Summary of the technical audit process
(After Public Works Directives, 2002)

2.5.3 Functions of a technical audit

The major function of a technical audit is to identify potential project risks following variations in any aspect of a project and then suggest solutions to mitigate such risks.

Adaptation of functions usually has to be made to suit each project that is audited because of the unique nature of each project. A variation in any of the processes detailed below if not carefully monitored may adversely affect a project (Cohen, 2000).

a) Project management

The purpose of this segment is to gain a detailed understanding of how the project team was constituted. Engagements of consulting firms can be very profitable because of failure on the part of the employer to monitor, interpret, manage and account for cost data.

b) Cost management

Here the auditor needs to gain a detailed understanding of the specific job components that affect the overall cost to the employer and to ensure that discrepancies do not exist between the contract billings and the actual payments.

c) Schedule management

This section is analysed to gain a detailed understanding of the scheduling of the overall project to ensure timely completion of the work and that appropriate steps are taken to mitigate delay.

d) Scope management

Variations are common on a construction project. The aim here is to ensure that any change in scope growth is well managed so as not to lose adherence to the project budget and project completion period.

e) Risk management

Risk assessment is a continuous process throughout the project life cycle. The main objective is to identify and minimize risks and ensure that a pro-active approach towards risk allocation and management is taken.

f) Quality management

The specific objective of this element is to assess whether the needs for which the project was undertaken are achieved, including employer satisfaction.

g) Contract development

The auditor has to ensure that the project is being managed in accordance with the construction industry guidelines and that all the relevant documentation is in order.

h) Contract administration

The main objective here is to review how the project contract is being administered and ensure compliance with contract provisions.

i) Project communications or reporting

Information flow and ensuring that the best system is in place is important. Furthermore, it is imperative to establish whether critical information on the project is passed through monthly progress reports, weekly coordination meeting minutes, performance reports, schedule and budget reports or project correspondence.

j) Document management

This function includes review of how written documentation is treated, establish whether confidentiality and security are high in priority and whether this information would be available in case of legal action.

The above functions can be either comprehensive to cover every known aspect of the project or be targeted and limited to any specific aspect of the project. It can also

depend on why the audit has been called for. There are various reasons why a technical audit may be called on a construction project. These reasons may include cost increases, delayed progress on site, determination of a contract, element of fraud, arbitration, claims and material change. All these reasons can be classified into either proactive or reactive auditing.

a) Proactive auditing

Proactive auditing is where the auditee initiates the process due to statutory requirements such as tax compliance. Such an audit is usually pre-arranged and the auditee has documentation and information readily available (Chatterji, 2001). Therefore, regulatory technical auditing is proactive.

b) Reactive auditing

This is usually triggered by suspicion of wrong doing. It is unannounced and usually results into a forensic audit. Forensic auditing could be defined as the application of auditing skills to situations that could lead to prosecution in courts of law (Chatterji, 2001). A technical audit can be part of a forensic audit as it is detailed enough to expose criminal aspects which may include financial, administrative or operational deficiencies. The commencement of an audit could be at any stage of a project life cycle.

Fraudulent claims are not uncommon in the construction industry. Richardson (2004) stated that the difficulty of fraud was that there was always an element of truth. In the construction industry common types of fraudulent claims include fictitious costs, non-allowable costs, non-allocable costs, false documentation, inflated costs, duplicate costs, erroneous methodology, conflicts of interest, conspiracy, bid rigging and related party transactions. Richardson (2004) emphasized that one major detection or prevention technique of fraud should be a contractual provision where an audit is a requirement. Internationally, a classic example of fraud and irregular accounting procedures was the Enron Corporation story, from being rated one of the 100 Best

Companies to work for in the USA to the worst bankruptcy case the world had seen. In Zambia, the audit of the Presidential Housing Initiative (PHI) in 2002 was as a consequence of reactive auditing.

2.6 Project life cycle

Hendrickson (2003) described the project life cycle as a process through which a project is implemented from cradle to grave. Construction projects can be divided into two development stages as indicated in Figure 2.3, with contract award or site possession as the dividing point.

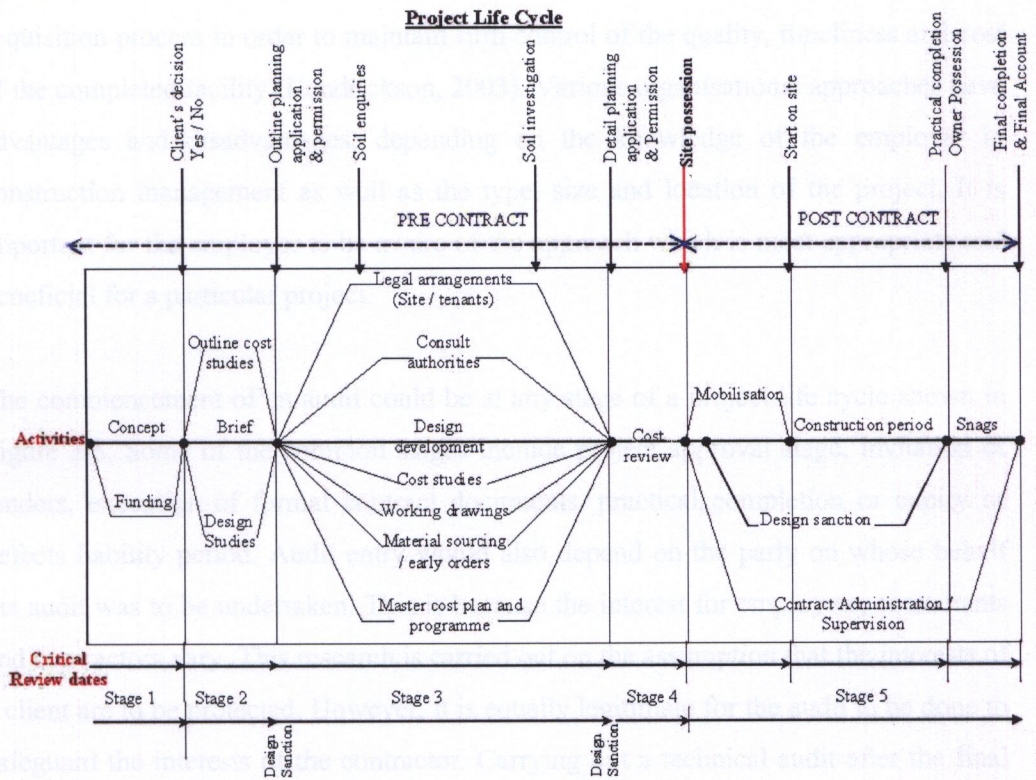


Figure 2.3: Project life cycle of a constructed facility

(After British Property Federation, 1983)

The first stage of development, from inception to contract award, is known as the pre-contract stage. This stage involves design, planning and tendering processes. The second stage of development, from commencement of construction to expiry of defects liability period or final account, is known as the post-contract stage. This stage involves physical erection of a facility. Each stage requires expertise, involving both technical and managerial skills of various consultants.

The decision to embark on a construction project usually represents a major capital investment, whether the client is an individual, a private corporation or a public body. Since a client is essentially acquiring a facility on a promise in some form of an agreement, it would be wise for any employer to have a clear understanding of the acquisition process in order to maintain firm control of the quality, timeliness and cost of the completed facility (Hendrickson, 2003). Various organisational approaches have advantages and disadvantages, depending on the knowledge of the employer in construction management as well as the type, size and location of the project. It is important for the employer to be aware of the approach which is most appropriate and beneficial for a particular project.

The commencement of an audit could be at any stage of a project life cycle shown in Figure 2.3. Some of the common stages include project approval stage, invitation of tenders, execution of formal contract documents, practical completion or expiry of defects liability period. Audit entry would also depend on the party on whose behalf the audit was to be undertaken. This is because the interest for employers, consultants and contractors vary. This research is carried out on the assumption that the interests of a client are to be protected. However, it is equally legitimate for the audit to be done to safeguard the interests of the contractor. Carrying out a technical audit after the final account has been prepared is not recommended because issuance of a final certificate is conclusive evidence that the works have been properly carried out and completed in accordance with the terms of the contract. Unless there is overwhelming evidence of

fraud, omission, fraudulent concealment of works, the certificate is conclusive evidence of satisfactory performance in any proceedings arising out of the contract.

2.7 Prevalent economic crimes

Due to the complex nature of construction, diversity of skills and the sheer size of some projects, coupled with long execution periods, it is very difficult for anyone who does not understand construction processes and procedures to uncover illegal activities in the sector. Even an informed technical auditor would have to be aware of what to look for when carrying out a technical audit. The Anti Corruption Commission Act No. 42 of 1996 of the Laws of Zambia defines corruption as the soliciting, accepting, obtaining, giving, promising or offering of gratification by way of a bribe or other personal temptation or inducement, or the misuse or abuse of a public office for private advantage or benefit. In an effort to fight corruption in the construction sector, Transparency International (2007) summarised economic crimes that can take place during the different phases of a construction project.

2.7.1 Pre-contract stage

At pre-contract stage, prevalent economic crimes identified include (Transparency International, 2007):

- fraudulent contractor qualification, where a bidder furnishes false documentation regarding plant and equipment, labour and the company's qualifications in order to win a contract;
- initiation of complex projects by government officials or persons in authority in order to make money by requesting favoured contractors to add percentages to their contract sums for the benefiting individuals;
- manipulation of pre-qualification criteria by the consultant so that the preferred bidder wins the contract;
- leaking the estimated or lowest price to the preferred contractor so that he could quote lower and win the bid;

- consultants or owners not disclosing their interest in companies that are tendering for contracts;
- clients not disclosing their inadequate financial status but commencing projects knowing that the works would encounter financial difficulties. This practice becomes an economic crime when contractors offer their assets as collateral in financially deficient projects; and
- collusion, also known as bid rigging, when competing contractors tender at higher prices to ensure that a particular contractor wins the tender. Transparency International (2007) defined collusion to include activities such as a “cartel”, “anti-trust” or “anti-competitive” offences.

These crimes can be prevented, minimised or uncovered by carrying out pre-contract audits which are reviews of pre-qualified contractors, development financiers, consultancy selection, types of contracts to be used, procurement systems, reviews of proposed modifications to existing contracts and any significant deviations and deficiencies in the cost estimates used in contractors' tenders.

2.7.2 Post-contract stage

Post-contract audits analyse differences in bids and actual conditions in terms of contract award, financial and internal controls and such issues as modifications to designs. Common economic crimes at this stage include (Transparency International, 2007):

- contractors supplying inferior, but being paid for higher quality materials;
- the client bribing the consultant to delay the issuance of a payment certificate because he does not have sufficient funds at the time the claim for payment is received;
- fraudulently increased variation claims and the extra money shared between the certifying consultant and the contractor;

- extortion by client's personnel for a fee from the contractor to ensure certificates are paid quickly; and
- cost engineers, commonly referred to as quantity surveyors, falsely increasing the quantities of certified works in order to obtain extra money from the contractor.

2.8 Fight against unethical practices

Corruption is said to be one of the oldest vices in the world but the rate at which it has spread and increased is alarming. Today the world is clamping down on this vice and Zambia, in joining the campaign against corruption formed the task-force against corruption. Government embarked on a relentless campaign to rid the society of corruption and to ensure that all those involved in such practices were brought to book, regardless of their status in society. Through institutions like the Anti-Corruption Commission (ACC) and the Task Force on Corruption, government hoped that a corruption free Zambia would one day be created. The Zambian construction industry could join in this campaign by advocating for mandatory technical audits. At the heart of technical auditing are the core values of transparency, accountability, fairness and responsibility. Technical audits are synonymous with the elimination of corruption. Today, companies view corruption as a price that they are prepared to pay to stay in business, despite the risks. In the construction industry, it is easy to incorporate 'the corruption fee' either in the preliminary and general items, as a contingency or merely as an overhead.

The lack of accountability in Zambia led to the establishment of civil society, non governmental organisations (NGO's) as watchdog institutions involved in public finance management. Advocacy for mandatory technical audit is one way the construction industry can contribute to public finance management. Transparency International (2007), in its fight against corruption, has developed a Project Anti-Corruption System (PACS) specifically for construction projects. This system has 19 modules. PACS was designed to be implemented at the outset of a project by the project owner. It recommends the appointment of an independent assessor in all

construction related transactions and the signing of anti-corruption procurement requirements under PACS module 7 to which the project owner and the contractor would be bound.

The call for technical auditing comes at a time when there is concern about the overall quality of construction products and that appropriate value is not always received for the money spent. As a new concept, the unwillingness to accept technical auditing is exacerbated by a general lack of capacity in vital auditing institutions in Zambia. Therefore, establishing technical auditing capacity and procedures would be a challenge. In Zambia, one area where technical auditing capacity could be established is the Office of the Auditor General (OAG) whose responsibility it is to audit all public accounts and ensure that public funds are accounted for.

2.8.1 The Office of the Auditor General

The Office of the Auditor General (OAG) was established under Article 121 of the Constitution of Zambia and is governed by the Public Audit Act of 1980. The Act gives the Auditor General (AG) authority to audit books, records and reports of institutions in which government has an interest such as accounts of parastatals, statutory corporations, and every private institution which receives a government grant, subsidy or subvention in any financial year. The OAG is immune from any action and proceedings in respect of the findings of any audit. Obstruction of the OAG in the exercise of its functions is an offence. Article 121 sub-clause 4 of the Constitution requires the AG to send an annual report to the Republican President, who is required to table it before the National Assembly (Nchite et al, 2004). This report is then debated by the Public Accounts Committee of the National Assembly which plays a watchdog and oversight role over executive expenditure of funds appropriated by parliament. The OAG is further empowered to have access, for the purposes of audit scrutiny, to all contracts involving government or its agencies and enterprises and may request from independent auditors of parastatals any document, reports, or information relating to the accounts of parastatal companies.

From the above, it can be observed that the basic legal framework for technical auditing is in place. What is required is a policy regarding technical auditing.

2.8.2 The Zambia Public Procurement Authority

Another important organisation to consider is the Zambia Public Procurement Authority (ZPPA) created in 2008 to replace the Zambia National Tender Board (ZNTB) Act CAP 394 of the Laws of Zambia of 1982. The law was revised to ensure transparency and accountability in public procurement. It is further responsible for regulating and controlling practices relating to public procurement in order to promote the integrity of fairness and public confidence in the procurement process. Adherence to this act forms the basis of technical audits for public contracts. Whilst the ZNTB governed the formation of tender committees at central, provincial, parastatal, ministry and district levels the ZPPA Act mentions the establishment and functions of procuring entities, procurement committees and procurement units. It sets the general provisions and financial limits of these entities. Section 9 of the Act provides for the establishment of an inspectorate unit whose responsibility is to “monitor, in accordance with the rules or regulations made under the Act, the procurement performance of procurement entities”. Although the procurement guidelines provide for a transparent system for procuring goods, services and works, they are still vulnerable to abuse and manipulation by corrupt officials. Public servants engaged in the procurement function are susceptible to unacceptable influence and pressure from their superiors to violate laid down procurement procedures (Lolojih, 2003). Lolojih (2003) showed that it is the implementation of the Act that is the problem and not the Act itself. The inspectorate unit which is supposed to monitor the flouting of any provision of the Act is not performing its duties.

The major changes to ZNTB Act under the current provisions are the inclusion of: Part II which describes the powers and functions of ZPPA; methods of procurement which specify private public partnership funding (clause 35) and community participation in

procurement (clause 36); the eligibility, qualification and disbarment of bidders under Part VII; and provision of arbitration under Part VIII of the Act.

2.8.3 Financial auditing firms

The trend in Zambia has been to utilise auditors with an accountancy background to audit construction projects. These typically result in a checklist of minor accounting issues. International accounting standards (IAS11) (2003) on construction contracts describe the treatment of revenue and costs associated with construction contracts. Because of the nature of the activity undertaken in construction contracts, the date at which the contract activity is entered into and the date when the activity is completed usually fall into different accounting periods making it difficult to determine when contract revenue and contract costs should be recognised as revenue and expenses in the income statement. When auditing materials in stock, a financial audit would just ensure that the materials issued correspond with the materials purchased and the balance in stock. However, a technical audit would ensure that the materials issued for the project corresponds with the contract drawings. For instance, after a financial auditor accounted for building material stock, it was discovered that the quantities of building materials issued from stock for construction were higher than estimated. After checking the drawings and preparing a material schedule it was discovered the quantity of paint issued to the site was double the estimated quantity and three (3) water closet (WC) pans were issued to site for a design that only incorporated 2 WC pans. Such anomalies would have been highlighted in a technical audit. Furthermore, when considering variations, a financial audit would automatically include this to contract cost. On the other hand, a technical audit would question the variation, its relevance and if it exceeds 25 percent of the original scope of works would be treated separately.

When matters are referred to arbitration, it is not accountants who are brought in to resolve the disputes. Though the resolution would be translated into financial terms, accountants are not suited for this type of task as they do not understand the complex construction process.

2.8.4 Dispute resolution

The common type of contract signed on most building construction projects in Zambia between the employer and the contractor is the Articles of Agreement and Schedule of Conditions of Building Contract Private Edition with Quantities 1970 Edition (Revised 1972) issued by Joint Liaison Committee of the Building Industry and Allied Professions popularly known as the ZIA Form of Contract. When construction disputes arise, they are referred to arbitration under Clause 35. The substantive law used is the Model Law incorporated in the Arbitration Act, 2000 under Part III of the Act. From research it has been observed that majority of disputes arise from five clauses namely:

- Clause 2 – Architect’s Instructions;
- Clause 11 – Variations;
- Clause 23 – Extension of Time;
- Clause 24 – Loss and Expense caused by disturbances of regular progress of the works; and
- Clause 30 – Certificates and Payments.

a) Architect’s instructions

Under the contracts signed in Zambia, the architect is the project leader in the administration of a building project and operates as an agent for the employer. This means that when the architect issues an instruction to the contractor, the employer will pay the agreed amount when necessary. All instructions should be in writing and any oral instructions have to be confirmed in writing by either the architect or the contractor. Usually the financial aspect of the instruction is calculated but disputes arise from non-financial considerations such as delays caused by the instruction. A technical audit analyses each instruction and recommends a fair assessment of each instruction.

b) Variations

The clause on variations empowers the architect to issue instructions requiring change to the works and expenditure of provisional and prime cost sums. The quantity surveyor then measures and values the work. Disputes usually arise from what constitutes a variation. When the nature of the works described in the contract documents can be shown to be substantially different to that carried out, then the contractor will be entitled to reprice the work accordingly. An increase for a proposed variation of more than 25 percent of the original contract may be considered as new works as authorizing such variations would provide opportunity for fraudulent activities and disadvantage other contractors. Again, variations may prolong the construction period causing this to become a contentious issue if not handled properly. Technical audits are best suited to handle variations.

c) Extension of time

The initiative in seeking an extension of time must be made by the contractor. Most contractors assume that this is automatic once delays occur as a result of architects' instructions, variations, shortage of building materials or bad weather. Reasons for delay have to be tabled and if acceptable the architect may revise the completion date accordingly. Extension of time may be granted with costs or without costs. The contentious factor connected with the clause regarding extension of time is the aspect of any financial adjustment to the contract sum either in connection with damages for non-completion under Clause 22 or the loss and expense to the contractor resulting from the delay as stated in Clause 24. Once again a technical audit would highlight all the delays on a project and recommend imposition of a fair and realistic rate for liquidated and ascertained damages that is commensurate with the costs consequent to delays and according to contract conditions.

In the matter of arbitration between Prince Construction Company Limited (claimant) and Zambia Revenue Authority (ZRA) (respondent) the dispute was over extension of time granted with related costs. The claimant argued that 16 weeks extension of time

had been granted at a cost of K616,462,879.11 whilst the respondent maintained that only 12 weeks had been granted at a cost of K344,109,579.12. The final award ordered the respondent to pay the claimant K 558,026,378.56 inclusive of interest and VAT. Though the certificate of practical completion stated the completion date as 31st March, 1999, an arbitrator was only in place on 16th July, 2002 and the final award was made on 21st February, 2003 (Chalwa, 2003). The respondents appealed to the courts of law but the award was upheld on 19th April, 2004. The dispute arose during execution of the contract but was only resolved four years later. Had a technical audit been available all the delays which arose from the extension of time would have been analysed and been readily available reducing the time required for assessment.

d) Loss and expense caused by disturbances of regular progress of the works

The main purpose of this clause is to reimburse the contractor in those circumstances where they have suffered loss and expense and will not be reimbursed elsewhere under the terms of the contract. The loss has to be direct. Disputes arise from ascertaining the loss especially for items which are seldom straight forward such as head office overheads, loss of profit, increased costs, finance charges and where the preliminary and general items are not a separate item but constitute part of the Bill of Quantities (BOQ) rates.

e) Certificates and payments

Interim certificates should be prepared monthly, or as stated in the contract, until the certificate of practical completion is issued. The employer may retain an amount on each interim valuation known as retention. Contentious issues on interim certificates include deductions for recovery of any advances paid. Once a final certificate is issued it becomes difficult for the client to raise disputes against the contractor because issuance of the final certificate is conclusive evidence that the works have been properly carried out and completed in accordance with the terms of the contract.

The above clauses have financial implications and it is this cost that is at the heart of construction disputes. Where technical audit reports are available, construction disputes are rare and where disputes arise, they are resolved quickly as all the information is available. Apart from preventing, minimising or uncovering economic crimes, technical audits could be beneficial in many other ways.

2.9 Benefits of technical auditing

The main benefit to clients is the assurance that they are getting value for money. There is usually secrecy surrounding projects where economic crimes have been committed. Consultants and contractors that have been subjected to audits and come out clean usually gain confidence. They feel liberated to openly make disclosures about their projects. Other benefits resulting from technical audits of construction projects include (Singh, 2005):

- lowering the cost of finance by eliminating corruption;
- identifying fraud situations which could alert financiers of projects to take appropriate action;
- recovery of any fraudulent financial loss;
- strengthening weaknesses in project procedures, processes and administration;
- strengthening professionalism in the construction industry;
- building construction industry credibility and enhancing accountability to taxpayers;
- basis for requesting additional funding for on-going projects;
- providing an independent and objective perspective so that decisions to expend public funds involve balanced and extensive information;
- availability of information for tax compliance;
- availability of information in case of a dispute; and
- using the audit report as a communication tool among parties to the contract.

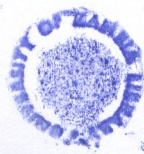
2.10 Summary

This chapter examined a range of available literature on technical auditing. One observation made was the scarcity of literature on technical auditing in Zambia. This notwithstanding, the chapter reviewed available literature and discussed the role technical auditing could play in the *Zambian construction industry*. It was further analysed that had technical audits been adopted earlier some of the circumstances the *Zambian construction industry* found itself would have been avoided. Current financial audit guidelines were examined and it was identified where they were lacking in exposing the economic crimes in the construction industry. The chapter highlighted pre and post contract economic crimes in the construction industry and the importance and benefits of technical audits. Table 2.1 summarises the literature that was reviewed and provides objectives of those studies, the methodology used and conclusion and comments in the form of a critique. The next chapter examines the research methods employed to achieve the objectives of the study.

Table 2.1: Content analysis of reviewed literature

Author	Year	Title	Objectives	Methodology	Conclusions/Comments
1. Central Statistical Office	2008	Selected Socio-Economic Indicators	Reports current socio economic indicators such as gross domestic product (GDP) etc. for Zambia	Descriptive	Official status of Zambia's economy and demography
2. Sweet R.	2008	Day of Judgement	Indictment of 112 construction companies accused of bid-rigging by the Office of Fair Trading (OFT) in the UK in April 2008	Case study	Shows work of OFT. Through whistle blowing some companies were pardoned. The construction sector in developed countries has not been spared by unethical practices.
3. UK Anti-Corruption Forum	2008	Preventing Corruption - Guidance for Professional Bodies	Assist professional bodies in the infrastructure, construction and engineering (IC&E) sector to establish effective rules and procedures to reduce the incidence of corruption involving their members and to deal effectively with those incidents that do arise.	Explanatory	Provides examples of activities which are likely to be both a breach of the professional body's rules of conduct and a criminal offence, disciplinary procedure and penalty for the guilty party. This eliminates doubt for members participating in corrupt activity claiming that they were not aware that the activity was unethical
4. Andreski A.	2007	Overview of Construction Sector Transparency Initiative (CoST)	Aims to increase transparency and accountability in the Zambian construction sector	Workshop presentation	Zambia's efforts to tackle corruption in the construction sector.
5. International Federation of Consulting Engineers(FIDIC)	2007	GAMA 2007 Africa Regional Conference	Focused on ways the engineering and construction industry could eliminate economic crimes for the client to obtain value for money	Exploratory Workshops, public discussions	Africa's initiative to fight corruption in the construction sector. Africa has joined the fight against unethical practices
6. Ministry of Communication and Transport	2007	Technical Audit of the Chingola-Kasumbalesa Road Rehabilitation Project	Indicates results of a technical audit carried out at the request of the Financiers of the project, the World Bank.	Case study	The financiers did not give authority for the variations carried out on the project resulting in a mis-procurement

Author	Year	Title	Objectives	Methodology	Conclusions/Comments
7. Transparency International	2007	Preventing corruption on construction projects	Introduce measures that will deter corruption in construction projects	Descriptive	Some measures are practical and can help prevent corruption
8. Transparency International	2007	Anti-corruption training manual – (infrastructure, construction and engineering sectors) International version	Introduce measures that will deter corruption in construction projects	Descriptive	Some measures are practical and can help prevent corruption
9. Transparency International	2007	2007 Corruption Perceptions Index (CPI) Regional Highlights: Africa	Ranks various countries according to the Transparency International Corruption Perception Index.	Correlational	Zambia is ranked 28 out of 52 indexed countries in Africa. Zambia's CPI is 2.6 meaning that corruption is still very rampant in Zambia
10. Allen J.	2006	The Crack Down Begins	Highlights efforts to fight corruption in construction	Case study	Indicates blacklisted construction companies by the World Bank. Blacklisting of contractors can be an effective deterrent.
11. Chartered Institute of Building	2006	Corruption in the UK Construction Industry	Highlights results of a survey carried out in the UK construction industry.	Questionnaire survey	Respondents felt that corruption existed in the UK but to what extent was not clear. Prevalence of various unethical practices varied with what was pertaining in Zambia such as the employment of illegal immigrants on construction sites.
12. Transparency International	2006	New Index Highlights Failures in the Fight Against Corruption: The University of Passau compiles the 12th Corruption Perceptions Index (CPI) on behalf of Transparency International	Highlights corruption levels in various countries.	Correlational	Corruption in Zambia is still very rampant and is practised mostly among senior politicians



Author	Year	Title	Objectives	Methodology	Conclusions/Comments
13. Singh G.	2005	Audit of Construction Projects (Building and Infrastructure)	Gives guidelines for the audit of construction projects	Explanatory	Explains that the responsibility and role of the auditor ends with the audit report and recommendations being submitted.
14. Nchite Roy & Nsana Stuart,	2004	Public Finance Management and Utilisation Project Report on Strategies and Tools for Civil Society Monitoring of Public Finance Management in Zambia	Highlights Public Finances Management in Zambia (PFM) and suggests Systems of Tracking and Documenting the Abuse of Public Funds.	Exploratory Workshops, public discussions	Zambia is not necessarily poor but probably just faces major challenges in the management of its resources such as finances.
15. Townsend R. L.	2004	Construction Audit Procedures	To use outlined construction audit procedures when conducting reviews of transactions related to construction activity.	Case study	Because of the unique nature of each project, these procedures can be adapted to each project that is audited. They can also be used to develop specific task oriented audit tests tailored to the subject under review.
16. Petts Consulting	2003	Technical Auditing	Gives the definition of technical auditing and how it complements financial auditing	Descriptive	Overview of the need of technical auditing
17. Hendrickson Chris	2003	The Owners' Perspective	To consider the construction process through the eyes of an employer (owner)	Explanatory	It is very difficult to consider "an owner", because owners can be corporate entities, individuals etc. Therefore management of a construction project lies in the ability of various consultants to apply fundamental principles to solving problems in the new and unfamiliar situations which have become the hallmarks of the changing environment in the construction industry.
18. Lololjhi P.K.,	2003	Report on Government Procurement Systems	Highlights possible weaknesses in the Government Procurement systems.	Exploratory Interviews and questionnaire surveys	Public confidence in the procurement system has been severely eroded due the uneven level playing field created through tenders that are only advertised in the foreign press, and unpublicised

Author	Year	Title	Objectives	Methodology	Conclusions/Comments
19. Chaiwa H.B.	2003	Arbitral award in the matter of Construction Limited vs Zambia Revenue Authority	To resolve the dispute which arose between employer and contractor	Case study	tender results. Matter referred to arbitration but still took about 4 years to resolve. Technical auditing would have reduced dispute resolution period.
20. Institute of Public Works Engineering Australia	2001	Local Government Road Safety Audit Strategy & Policy Statement	For Australian local authorities to adopt a formal process of road safety auditing within the Policies and Procedures of Council thereby adopting and promoting a pro-active role in the safe management and operation of the local road network.	Explanatory Collaborative/brainstorming	A formal audit policy is required if it is to be adopted by various stakeholders. In Australia, a road safety audit and traffic impact report once prepared can be used to improve road network safety
21. Cohen Susan	2000	Construction Performance Audit Guide	Areas to consider when carrying out an independent review of a construction project	Case study	This is a complete list examining audit functions of every aspect of a project including the pre and post contract stages.
22. Vickery Kenneth P.	1986	Black and White in Southern Zambia: The Tonga Plateau Economy and British Imperialism, 1890-1939	Relationship and dependency between the native Zambians and their colonialists	Collaborative/brainstorming	The colonialist introduced their type of construction to Northern Rhodesia but the native Zambian had no design role to play as a slave.
23. Zambia, Government of the Republic of	1982	Zambia National Tender Board Act CAP 394 of the Laws of Zambia	Regulates and controls the procurement of goods and services for government and parastatal bodies	Descriptive	Provisions of the act are adequate but the inspectorate unit created to monitor compliance is not performing its functions.
24. Zambia, Government of the Republic of	1980	Public Audit Act of 1980	Gives guidelines as to audits and reports of institutions and companies in which government has an interest	Descriptive	The Office of the Auditor General executes audits and reports its findings to the President but since corruption in Zambia lies with Senior politicians publication of these findings is very selective.
25. Zambia, Government of the Republic of	1978	Third National Development Plan 1979-1983	Development plan for the Zambian Economy.	Collaborative/brainstorming	Adequately defines the construction industry. Though planning has been done there has been no evaluation done to see if the objectives of the plans have been met.

Author	Year	Title	Objectives	Methodology	Conclusions/Comments
26. Zambia Institute of Architects	1972	Standard Form of Building Contract Private Edition WITHOUT QUANTITIES 1970 Edition	Standard type of contract signed on most construction projects between project employer and contractor in Zambia	Descriptive	This contract is almost 40 years old and should be revised to take into account prevailing conditions such as project management, technical auditing etc.
27. Elliot C.	1971	Constraints on the Economic Development of Zambia	Status of economic development in Zambia with emphasis on sectorial development i.e. construction industry supported by statistics	Collaborative/brainstorming	Decline of the Zambian construction industry

Chapter Three: Research methodology

3.1 Introduction

The previous chapter presented the literature reviewed over the course of this study. This chapter examines the overall approach to the research process by considering the various research methods available. The research methods are then evaluated with regards to their strengths and limitations. Finally, those methods that are appropriate in achieving the objectives of the research are selected.

3.2 Definition

The word *research* is derived from the Latin word meaning *to know* (University of Malawi, 2005). Henrichsen et al (2004) defined research as an organized and systematic way of finding answers to questions. It is organized and systematic in that there is a definite set of planned procedures and steps that are followed based on a specified scope.

3.3 Research paradigm

Broadly, there are two widely recognised research paradigms: the positivist and phenomenological (Management College of Southern Africa, 2002).

3.3.1 Positivist paradigm

The positivist research approach employs strategies such as experiments and surveys and produces quantities or statistics to establish an objective view. It is also referred to as the quantitative method because data is usually highly specific, precise and reliable. It is commonly adopted by researchers in the natural sciences. One disadvantage of this approach is the use of large samples to validate results.

3.3.2 Phenomenological paradigm

The phenomenological method, sometimes referred to as the qualitative approach is mostly popular in social science research. It produces rich qualitative data following inductive reasoning. This research type is usually carried out in natural settings. Disadvantages of this method include subjectivity of the research and its low reliability.

This study adopts a combined research approach. It uses both quantitative and qualitative research. Cohen et al. (2000) state that the issue is not which approach is adopted over the other but rather making use of the most valuable feature of each type. In this study quantitative research uses numerical measurement and statistical analysis to determine the prevalence of unethical practices in the Zambian construction industry. On the other hand qualitative research uses information on selected case studies to highlight fraudulent opportunities and possibilities of prevention through technical auditing.

3.4 Types of research

Research may be conducted because of a number of reasons such as:

- curiosity in the case of basic research;
- to improve or justify the need of a system in applied research ; or
- recognition of a problem in action research.

3.4.1 Basic research

Basic research also known as fundamental or pure research, is driven by the researcher's curiosity. The main motivation is to expand knowledge, not to create or invent anything (University of Malawi, 2005). It can also be carried out to improve one's understanding of issues such as where an existing theory, technique or group of ideas is re-examined possibly in a different organisational or social context.

3.4.2 Applied research

Applied research is designed to solve practical problems of the modern world, rather than to acquire knowledge for knowledge's sake (University of Malawi, 2005). One weakness of this research type is that it may limit the study to the entity being examined. Therefore, results of this type of research should not only be to improve ways or techniques of the examined entity but to ultimately improve the human condition.

3.4.3 Action research

Brewerton and Millward (2001) stated that in action research, the researcher is keen to develop a partnership with participants, exploring together the various issues surrounding the research question in an effort to develop mutually beneficial research aims and objectives and to ensure that the research programme has a lasting beneficial effect for all involved. The purpose of action research is not to test or develop a theory but rather to find a solution to a practical problem (Welman and Kruger, 2001). A weakness of this research type is that since the researcher is involved in the change process, subjectivity may increase whilst objectivity may suffer.

3.5 Research design

Brewerton and Millward (2001) noted that different research approaches use different techniques or methods because they have different aims. When reviewing literature, the researcher is expected to identify the research approach to be employed. Welman and Kruger (2001) described research design as the plan according to which research participants or subjects are obtained and how information collected from them assists with reaching conclusions about the research problem. Research approach can be classified as:

- exploratory;
- descriptive;
- explanatory or analytical;

- predictive;
- experimental;
- correlational; or
- case study.

3.5.1 Exploratory research

Exploratory research is conducted when a researcher is exploring new insights about a phenomenon. Though this is typically qualitative research, the approach is to determine whether or not a phenomenon exists and to gain familiarity with such a phenomenon rather than compare it with other phenomena (Welman and Kruger, 2001). A major limitation of this research approach is that there are few or no earlier studies to which references can be made for information. This study can not be described as exploratory because it drew from previous research.

3.5.2 Descriptive research

The purpose of descriptive research is to describe an existing phenomenon (Welman and Kruger, 2001). Descriptive research is used to identify and obtain information on the characteristics of a particular issue. It may describe the relationship between variables without trying to explain it. The data collected is often quantitative and statistical techniques are usually used to summarise the information.

The study in this dissertation included descriptive research in as far as establishing the prevalence of unethical practices on construction projects in Zambia. But the study went beyond mere description and employed explanatory research to explain why technical auditing would benefit the Zambian construction industry.

3.5.3 Explanatory research

Explanatory or analytical research goes beyond merely describing characteristics. Findings are analysed and explained to establish causes and effects. On the basis of the

results of the study, a researcher would attempt to explain the findings (Welman and Kruger, 2001). Thus, analytical research aims to explain the relationship among variables. Explanatory research is valuable for understanding questions of efficacy but is limited when it comes to establish whether a particular action will yield desired results when carried out in the real world.

3.5.4 Predictive research

Predictive research goes beyond the explanatory approach by forecasting the likelihood of a similar situation occurring elsewhere. The researcher, on the basis of findings may wish to predict the phenomenon occurring again (Welman and Kruger, 2001). The study reported in this dissertation attempted to predict that economic crimes would continue to occur on construction projects in Zambia if nothing was done about it, hence the need for technical auditing to reduce or minimise opportunities of such crimes occurring.

3.5.5 Experimental research

Generally, research problems are concerned with relationships between variables. To determine this relationship, experimental and non experimental methods are used. Experimental research is commonly used in scientific studies. Brewerton and Millward (2001) described experimental research as the manipulation of independent variables under highly controlled conditions in order to observe any changes in dependant variables. Therefore, the researcher would be trying to determine the cause-effect relationships. However, a major limitation is that this method is usually done in the laboratory allowing for highly controlled settings. These artificial conditions may not reflect the real world and what really happens out there.

3.5.6 Correlational research

Correlational or non-experimental research attempts to explore the relationship between at least two variables within a given environment (Brewerton and Millward, 2001). Changes to one variable are accompanied or associated with changes to the

other, but that one change is not necessarily the cause of the other. For instance, a causal relationship between variables X and Y also implies a correlational relationship between them. However, a correlational relationship between variables X and Y is not necessarily an indication of a causal relationship between them (Welman and Kruger, 2001).

3.5.7 Case study

The term case study pertains to the fact that a limited number of units of analysis such as an individual, a group or an institution are studied intensively (Welman and Kruger, 2001). This allows the researcher to explore and understand problems, issues and relationships. When an institution or group is investigated, the researcher is conducting fieldwork. Welman and Kruger (2001) disclosed that whichever technique is used to collect data, the concern is not merely to describe what is being observed, but to search in an inductive fashion for recurring patterns and consistent regularities. Therefore, this method being a non-experimental, descriptive type of study and not an explanatory one, conclusions about cause-effect relationships cannot be drawn.

Advantages of the case study method include the capture of rich information from which potentially useful hypotheses can be generated. Case studies can be used as examples to illustrate problems or show benefits of particular practices resulting in making practical improvements to specific situations. They provide more comprehensive examination of a particular situation than any other research design. Because case studies draw from actual experiences and practices, they are strong on reality, making case studies useful as a consultancy.

The case-study approach raises concern because it does not allow the researcher to generalise from one case. The case would need to be contextualised and carefully described for others to consider its usefulness in other contexts and examples (Wisker Gina, 2001). Information collected from a case study may be retrospective

as some studies take long. In this sense, it is historical and is therefore subject to the problems inherent to memory. Sometimes, impartiality is lost and subjectivity becomes an issue.

The case study method was adopted as it was best suited in achieving the objectives of the study in question because this research is not experimental and cannot be conducted in the laboratory under controlled conditions. Through the case studies:

- the prevailing situation in the Zambian construction industry was determined;
- background information and key variables were gathered;
- possibilities which conflicted with the evidence collected was eliminated; and
- remedial action was recommended.

3.6 Data collection methods

Research involves the collection of data. All methods of data collection can be classified into primary or secondary data. Primary data is original in that it is information which has never been collected before. Secondary data is information already put together by someone else but reused in a different way by the researcher (Blaxter et al., 2001). Data is either qualitative usually words or text, or quantitative like numbers, statistics or financial. Quantitative data may be presented in graphical form.

3.6.1 Primary research

Primary research involves the location of a primary source. A primary source is the written or oral account of a direct witness of, or a participant in, an event or an audio tape, videotape or photographic recording of it (Welman and Kruger, 2001). In other words primary research is an investigation where data is collected directly using methods such as questionnaires or interviews. Such data is private to the researcher and, until published, is not available to anyone. Primary research is beneficial on relatively new topics or where few publications exist on the subject. In addition, it

supplements research in secondary sources and can be used to confirm or dispute national results with local trends. Despite the benefits of primary research, some common pitfalls include over-generalization of the results, biased methodology and non consideration of other related factors as it is very difficult to be able to study all the factors that relate to a specific group of people, event or occurrence. Common methods of conducting primary research include:

- questionnaires;
- interviews;
- observation; and
- diaries.

a) Questionnaires

One of the popular ways of collecting primary data is through questionnaires. As research instruments, most questionnaires are structured. When constructing questionnaires, thought has to be given between open ended questions where the respondents can formulate their own responses or multiple choice questions where respondents are restricted to particular responses. What may count as an advantage of open ended questions, may represent a drawback of multiple choice items, and vice versa (Welman and Kruger, 2001). Open ended questions which maybe more suitable for respondents who are highly educated maybe more difficult to score and compare because of the varying responses. Whereas multiple choice questions which may be easier to score, may generate incomplete results because the restrictive responses may result in participants not answering the question as there may not be adequate responses to their unique situation. Questionnaires can be used as a basis for a personal interview or a telephonic interview.

Questionnaires are considered advantageous because they are relatively cheap and they can cover a wide geographic area through hand delivery, postage, e-mail or fax. In addition, participants have time to consider responses thus avoiding embarrassment on the part of the respondent as there is no interviewer bias. Some

respondents prefer anonymity which questionnaires can provide. Because no prior arrangements are needed, questionnaires are appropriate for respondents in busy industries.

One disadvantage of questionnaires is that they assume no literacy problems. Certain questions may require an explanation and in the absence of the researcher, the respondent may not answer the question. Incomplete questionnaires may impact the findings negatively and the researcher would have to redesign the research instruments. Another disadvantage is that most questionnaires require a return deadline and there could be a time delay whilst waiting for responses to be returned. Sometimes participants may be unwilling to give correct answers for questions relating to income levels and social status which may be exaggerated while age details could be minimised.

The study reported in this dissertation employed questionnaires to gather primary data from the construction industry. Obtaining an appointment for the targeted population sample would have proved difficult but the use of questionnaires addressed this concern since no prior arrangements were needed. The Zambian construction industry covers a wide geographical area which made it ideal to distribute some of the questionnaires via email. This study investigated a subject of unethical practices which is generally considered a sensitive topic as such it was feared that participants would give inadequate information. But because the questionnaire as a research instrument provided anonymity, this enhanced the confidence that the participants responded honestly and that the results derived from of the study were reliable.

b) Interviews

Generally, interviews can be described as one-on-one or small group question and answer sessions. Interviews provide a lot of information from a small number of people and are useful when the researcher requires an expert or knowledgeable opinion on a subject. Interviews can take a variety of forms depending on the type of data

required to address the research question being asked, as well as on the availability of resources (Brewerton and Millward, 2001). There are three types of interviews namely structured, unstructured and semi structured.

i) Structured interviews

Structured interviews involve having written down questions which are asked to an interviewee. The researcher may have fixed questions the interviewee might respond to. This method ensures a quick interview and easy comparison of responses. The interviewer is there to clarify any confusion the questions may pose. Disadvantages include restriction of the interviewee and restriction of further research and investigation into the area of interest.

ii) Unstructured interviews

Unstructured interviews provide the interviewer complete freedom to ask any question in the area of interest to the interviewee, allowing for questions to change during the interview depending on how the interview proceeds. The advantages of a structured interview are the weaknesses of an unstructured interview and vice versa. The interviewee's responses are not restricted and usually provide in-depth data gained from experience whilst comparison, quantification and analysis of responses becomes demanding.

iii) Semi structured interviews

Semi structured interviews incorporate elements of both quantifiable, fixed choice responses and the facility to explore and probe in more depth certain areas of interest (Brewerton and Millward, 2001). Therefore this type of interview has both advantages and weaknesses of interview methods discussed earlier. Whilst being easy to compare, quantify and analyse, the method also allows for exploration in the area of interest resulting in in-depth information being provided.

Advantages of interviews in general include the interviewer being in control and able to assist if there is a problem. The response rate is good, complete and immediate. Depending on the situation, recording equipment or props could be used. The one-on-one session presents the interviewer an opportunity to investigate motives and feelings and assess the characteristics of the respondent by their tone of voice, facial expression and hesitation. In contrast, the disadvantages of interviews include the need to set up appointments for interviews, geographical limitations, high expenses and time consuming. Some questions, if personal, could cause embarrassment and sometimes respondents could be biased by trying to please, impress, create a false personal image, or by ending the interview quickly.

Telephone interviews are an alternative form of interview to the personal, face-to-face engagements. These were not used in this study because of the question of authority.

Because interviews are expensive, time consuming with geographical limitations, this study employed semi-structured interviews in obtaining views of stakeholders such as donor agencies, governmental organisations, private companies, audit firms, construction companies and construction consultants on whether introduction of compulsory technical auditing on construction project could help minimise or eliminate economic crimes.

c) Observation

Observation involves taking note and recording in as objective a way as possible, target events and occurrences, using whatever unit and level of analysis required for the achievement of research objectives. Brewerton and Millward (2001) emphasize that observation is a highly skilled activity which should not be considered lightly. Observation as a study method is suitable when the researcher hopes to learn more about a problem without the biased viewpoint of an interview. Observation can be disguised or undisguised. In disguised observation, participants behave naturally because they are unaware that they are being observed. In undisguised observation,

participants are aware that they are being observed. The problem with this is that people behave differently when being observed. There are two types of observational activity namely, participant and non-participant (Brewerton and Millward, 2001).

i) Participant observation

In participant observation, the researcher becomes part of the participants. This method is usually unstructured as it monitors all aspects of the phenomenon that seem relevant. The research problem is yet to be formulated precisely and flexibility is needed in the observation to identify key components of the problem. Participant observation has its roots in ethnographic studies, the study of man and races where the researcher would live in a tribal village, attempting to understand the customs and practices of that culture.

ii) Non-participant observation

In this method, the researcher observes from a distance, the interaction processes as the research problem is clearly defined and the information needed is specified. This makes the observation structured where the activity is guided by a checklist.

Generally, the observer merely records what takes place. Mechanical devices such as video recorders and closed circuit television can be used to record what is being observed. One advantage of the observation method is that information is first hand and beneficial to group dynamics using it to identify weaknesses and strengths within a group. The findings are then used as a basis for intervention design.

A major pitfall of observation study is that one can not record everything. Therefore, the researcher's interest of observation has to be clarified. Observation study requires skill as in the use of mechanical devices and is time consuming. In non-participant study, the event being monitored might not occur during the allocated time. In all the different types of observation, the potential for bias is high. The validity and reliability of the interpretation of the findings raises concern as there is scope for

alternative interpretations. Therefore, observation findings should be treated as hypotheses to be tested rather than as conclusive findings.

The observation method was not selected as it was considered inappropriate for this study. This study deals with unethical practices which are generally concealed, and as such it would be difficult to observe these activities. In addition, observation of construction works is time consuming as construction projects normally have long durations.

d) Diaries

Diaries are a way of gathering information about the way individuals or organisations spend their time on professional activities. They can help to capture events that would otherwise disappear from memory (Wisker, 2001). It is common to keep site dairies on construction sites. Site diaries are a daily record of what takes place and are not a reflective analytical piece. Generally site diaries would have records of:

- anyone who goes to the site such as client, consultants, workers and visitors;
- any instructions given on site;
- work done on that particular day for instance, an entry for carpentry works would state: 4 no. doors fixed to first floor;
- plant or machinery used each day noting the fuel and oil consumed;
- building materials issued daily;
- materials tested or opened up for inspection; and
- any events occurring on site such as reports of accidents or near accidents, thefts, damages, penalties and absenteeism.

Diaries are kept by the contractor but can be inspected by employers and their representatives. Site dairies are not part of contract documents but may be used as a preliminary or basis for intensive interviewing. In technical auditing, site diaries are important documents. They become useful in the event of any substantial changes to the scope of works for whatever reason that may cause delays and additional costs, any

serious accident, natural disaster or claims by third parties. Absence of comprehensive and accurate site records or diaries have been contributory factors in hindering regulatory and investigative authorities to ascertaining causes of failures and thus completing their reports for submission to relevant authorities. Additionally, site diaries can help to protect or minimize liability of the client, developer, contractors and the relevant authorities against blame and possible financial claims by assisting in the identification of the parties responsible for the defects and deficiencies in the works. Thus the maintenance of comprehensive, accurate and complete site records and their safe custody during the post construction period is the common responsibility of all the involved parties.

3.6.2 Secondary research

Heaton (1998) described secondary research as investigation done for the purposes of a prior study. This is the research carried out in literature review in order to pursue a research interest which is distinct from that of the original work. In other words, literature review is secondary analysis of qualitative data. Secondary research is useful in the exploratory phase when the researcher is still getting ideas or where direct data collection is impossible. It also assists with definitions and descriptions giving authoritative knowledge to the researcher's work. Other advantages of secondary data are that primary data may be difficult to collect, time consuming and expensive whilst secondary data already exists. Secondary data complements primary data.

One major limitation of secondary research is that the data could have been collected for a different purpose and over time the problem of comparability could surface. Equally, over time, questions as to the validity or subjectivity of quantitative data such as statistics could arise. Nonetheless, sources of secondary data include paper-based sources such as books, journals, periodicals, abstracts, indexes, directories, research reports, conference papers, market reports, annual reports, internal records

of organisations, newspapers and magazines and electronic sources such as CD-ROMs, on-line databases, internet and e-mail.

a) Paper-based sources

Research is normally based on relevant thinking and literature review of research that preceded it in the relevant field of study. To develop an understanding of, and an insight into previous research findings that are helpful to achieve the research objectives literature research is used (Welman and Kruger, 2001). Literature review therefore is a logical, systematic and critical review of this body of knowledge providing authority for the current research. This study employs literature research to assist with definitions of key terms, indicate the current trends in the construction industry and validate the need for technical auditing in the construction industry. Below are some of the sources used in literature research.

i) Books

Books are referred to as storage of information on paper. There are a variety of books available. Books can basically be classified into three types namely: textbooks; research books; and edited books. Wilkinson (2005) states that text books are based upon the expertise of the author, containing some reference to research and the experiences of the writer whilst research books report on an area specifically investigated for the purposes of the text making them more focused and exploratory than text books. Finally, Wilkinson (2005) describes edited books as consisting of a collection of pieces or papers written by a variety of authors drawn together by a common theme or issue. Books are handy and can be used anywhere. Advantage of paper books include handwritten annotation, highlighting with coloured markers, underlining and bookmarking. Unlike the internet the reliability, status of the author, age of the material and details of sources and references is easily verifiable.

This study used books because they are authoritative as they have undergone some form of peer review process. Books are permanent and all books used in this study as references can easily be traced by other researchers.

ii) Journals and periodicals

There are various types of journals. Journals can be local, national and international, home and overseas, practitioner oriented or research based, popular and academic, abstracting journals (Blaxter et al., 2001). Wilkinson (2005) states that academic journals are by far the most popular literature sources by researchers and academics. Because there are a lot of journals available today, a journal ranking system has been developed. The ranking depends on the number of citations used from the journal. The more the citations the more relevant and significant the information is. This is the system used by the Journal Citation Reports (JCR) which presents quantifiable statistical data that provides a systematic, objective way to evaluate the worlds leading journals and their impact and influence in the global research community (Wilkinson, 2005).

Strengths of journals are that they are respected international refereed publications issued periodically. The articles published are of high quality undergoing a rigorous peer review process before publication. These articles are scholarly in nature and are considered serious, truthful and correct. The articles are authored by professionals in their respective fields thus providing a forum for disseminating knowledge and exchanging ideas between industry and academia. The journals are a good source of information because they are current and include material that has not yet made it or may never make it into books (Blaxter et al., 2001). One weakness is that some times the language used in the journals is very technical requiring a high academic level to understand the articles which may contain detailed statistical or other technical analyses of findings forming part of the articles. In some libraries, journals cannot be borrowed out. This makes it expensive because of photocopying expenses and subscription charges to obtain a copy of the journal.

Because journals publish original works that address cutting edge issues related to construction around the globe, a number have been used in this study such as ICON and Construction News, Journals of the Chartered Institute of Builders.

iii) Newspapers

Newspapers fall under the popular media category. Newspapers can be daily or weekly. The role of newspapers is to inform the public of events of importance and appropriate interest in a manner that is accurate and comprehensive and it is up to the public to make judgements on the issues. Generally, newspapers are loosely divided into national news, international news, advertisements, public opinion, sports news and editorial columns. Apart from reporting events, newspapers sometimes have special features articles which are in-depth reports of a particular subject. Editorial columns are usually critical reviews focused on a particular subject highlighted by the newspaper. Newspapers are fast gaining recognition as a valuable tool for public policy reform. Journalists are accountable to the public for their reports and the public have a right to voice its grievances against the media. A major advantage of newspapers is that the information is current. It is easy to read newspapers from other countries over the internet. Archives of the newspapers are kept and it is relatively simple to search for a previous event. Newspapers have pitfalls which include subjectivity and inaccuracy of the information released resulting in public apologies. The review process is less rigid than other forms of literature previously discussed.

The study used newspapers as part of its secondary research because this is one area where public views are highlighted. Some case studies were selected based on public outcry through excerpts from the newspapers.

iv) Reports

Reports are usually produced by institutions or organizations of different kinds, including employers, representative associations, political parties, trade unions, voluntary bodies, community groups, central and local governments and international

bodies (Blaxter et al., 2001). They are a good source of information because they contain information unique to the institution or organization. A report includes information such as the organization's operations, its performance and its future plans. In Zambia, reports by institutions or organizations are usually produced annually and are commonly referred to as annual reports.

This study used reports from the auditor general's office to identify the auditee's operations and compare auditing techniques used.

b) Electronic sources

Electronic sources include information obtained via e-mail, CD-ROM, or internet (Brewerton and Millward, 2001). The amount of electronic information is enormous and its accessibility makes it an attractive source of research. However, having the world's library at one's finger tips can be bewildering and time-consuming as one link leads to the next (Blaxter et al., 2001). One disadvantage of electronic information is that researchers must have access to a computer and be ready to pay for printing costs if a hard copy is desired.

i) Internet

Researchers are increasingly turning to the internet and online information providers to locate the information they need. The internet is a global collection of interconnected computers and computer 'networks' using a common set of standards and protocols, known as TCP/IP, which establish a framework for the way in which information is accessed and exchanged (Brewerton and Millward, 2001). No one owns or controls the internet since it comprises independently operated but co-operative computer networks, working together to supply and exchange information (Brewerton and Millward, 2001).

Today a manual search may prove to be inadequate and time consuming. Therefore advantages of the internet include the high speed output of computer searches at a

relatively low cost. Information from the internet is available 24 hours and can be accessed at the convenience of the researcher. Some websites allow interaction with the author. Unlike paper sources, the internet can contain animation whose picture and sound can allow those who are not literate to get information from the internet.

A drawback of internet information is that it is not permanent. Websites are continually updated and information accessed from a particular website may not be available years later for reference. Authority of a particular source of information becomes an issue because the internet is a public domain resource. Reliability of a website and determining the age of the material is difficult. A site maintained by an academic or government institution is probably more credible than one published by a private user (Brewerton and Millward, 2001). In addition, researchers must have reliable internet access.

The study reported in this dissertation used the internet to complement the scarcity of books available on technical auditing in Zambia. Because of the global nature of information, the data obtained was also used to compare trends in other countries.

ii) CD-ROMS

Electronic information such as abstracts, full length articles, references and e-books may be stored on CD-ROMS. Some advantages of e-books include reduced deforestation because e-books do not use paper and reduce over-printed or unwanted books. Electronic books are less bulky, cheaper and do not go out of print. One drawback of CD-ROMS is that they easily get damaged if not stored properly. Copyright issues arise because CD-ROMS can easily be copied and distributed.

3.7 Sampling

In research methodology, the researcher must have a method as to how they are to obtain research participants and gather information from them. The research participants come from a population. The population is the study object which may be

individuals, groups, organisations, human products and events or the conditions to which they are exposed (Welman and Kruger, 2001). It is impossible to include all members of the population hence researchers depend on data obtained from a sample of the population. There are a wide variety of sampling strategies available for use (Blaxter et al., 2001). These can be classified in two groups, probability and non-probability sampling.

3.7.1 Probability sampling

In probability sampling, every person or object in the population of interest has the same chance of being selected for the study. Though this might sound simple, the actual methods of probability sampling are complex. One advantage of probability sampling is the researcher being able to estimate the sampling error. Sampling strategies include (Blaxter et al., 2001):

- simple random sampling – selection at random;
- systematic sampling – selecting every nth case;
- stratified sampling – sampling within groups of the population;
- cluster sampling – surveying whole clusters of the population sampled at random;
- and
- stage sampling – sampling clusters sampled at random.

3.7.2 Non-probability sampling

Non-probability sampling may be used where the researcher lacks a sampling frame for the population in question or where a probabilistic approach is judged not to be necessary (Blaxter et al., 2001). Non-probability sampling may be broken down into:

- convenience sampling – sampling those most convenient to the researcher;
- voluntary sampling – the sample is self selected;
- quota sampling – convenience sampling within groups of the population;
- purposive sampling – hand picking supposedly typical or interesting cases;
- dimensional sampling – multi-dimensional quota sampling; and

- snowball sampling – building up a sample through informants.

Some advantages of non-probability sampling include ability to capture a wide range of facets and selection is deliberate allowing the researcher to select with prior design and purpose. This type of sampling is convenient and economic and is beneficial to pilot studies. Pitfalls include higher subjectivity and bias as compared to probability sampling thus distorting findings

The study targeted players in the five sectors of the construction industry namely, consultancy, contractor, manufacturing, supply and clientele because the technical audits advocated for are specifically for the construction industry. Because the study involves auditing, the population sample included traditional audit firms to ascertain their capability in conducting technical audits. The research adopted judgemental sampling because it was the most cost effective procedure for quality control. The cost of studying all items in the construction sector is prohibitive and would have taken a very long time. Therefore, purposive sampling was used where the researcher relied on their experience or previous research findings to obtain participants representative of the relevant population. The sampling was as follows: 14 from consultancy; 5 from contractor; 4 from manufacturing; 4 from supply; 27 from clientele sectors and 6 from traditional audit firms. The disproportionate sampling was eliminated through stratification of responses from various respondents.

3.8 Triangulation

This study employed different research methods which have different advantages and disadvantages and, given this fact, it made sense that a robust methodological approach that took account of the view points of both the positivist and phenomenological paradigms was adopted. Therefore, data triangulation incorporating aspects both of qualitative and quantitative data was employed. Triangulation derives its name from a technique used by surveyors in their work. It involves looking at the research question from several viewpoints, the same as mappers will place instruments on three hilltops

to get overlapping data sets concerning a particular point below (Olsen, 2004). The concept of triangulation can be applied to the way various different methods are used in the research process known as methodological triangulation or the way various theoretical perspectives can be combined known as theoretical triangulation.

3.8.1 Methodological triangulation.

In general terms, methodological triangulation can be used for a number of purposes (Livesey, 2007):

- to collect different types of information such as qualitative and quantitative or primary and secondary data;
- with two or more researchers using the same method such as observation and their findings can be compared to see if they agree that they have seen the same things in the same ways;
- to check that data collected in one form such as through a structured interview is both reliable and valid by using another method such as observation; and
- to verify that data collected is accurate.

3.8.2 Theoretical triangulation.

Theoretical triangulation is a much less common form of triangulation as it is possible to study the behaviour of a social group from both a structuralist and an interactionist theoretical perspective. For instance, a structuralist perspective might be a study group such as "the family" in terms of the institutional relationships that exist between the family and work, education, religion while an interactionist perspective might look at family life from the point of view of particular family groups or even individual members of different families.

Data triangulation was achieved through the use of questionnaire survey, structured interviews and case studies to investigate the prevalence of unethical practices in the

Zambian construction industry. In addition, the use of data triangulation effectively reduced data error and assisted to overcome problems of bias.

3.9 Summary

This chapter described common research methodologies and the available methods used to collect data. The strengths and weaknesses of the different methods were considered before selection of a suitable research design, able to meet the objectives of the study was made. The appropriate methods identified for the study were the case-study and survey methods using questionnaires and interviews to collect primary data. The internet was established as the main electronic source for secondary data whilst books, journals and newspapers were the paper based sources. Purposive sampling was used to target research participants from all sectors of the Zambian construction industry. Data triangulation was used to reduce data error and assist to overcome problems of bias.

The next chapter discusses and analyses data collected resulting in strategies that could prevent or minimise economic crimes from occurring in the construction industry in Zambia.

Chapter Four: Questionnaire and interview survey results

4.1 Introduction

Chapter three described the common research methodologies and the available methods used to collect research data. It was determined that the most appropriate method of collecting primary data for this study was through structured interviews and self administered questionnaires. This chapter focuses on the survey carried out, the data collected and its analysis. The objective of the survey was to investigate the nature and form of economic crimes in the Zambian construction industry; their prevalence; and establish whether existing institutions had the capacity to expose and prevent such criminal activities. The survey further examined the benefits of technical auditing, and their efficacy in reducing economic crimes in construction projects. Whistle blowing systems, contractor blacklisting and striking off consultants from their professional bodies were also investigated on their adequacy as deterrents of unethical practices. It was hoped that the questionnaire survey might act as an information tool that would highlight the potential of technical audits to combat corruption in the Zambian construction industry. Structured interviews were meant to enhance and verify the questionnaire results as part of data triangulation. Findings of the survey were further enhanced with case studies examined in the next chapter.

4.2 Surveys

Two forms of surveys, questionnaires and interviews were used in this study. Unethical practices are generally concealed as such respondents would often give inadequate information for fear of being quoted. Falsification would also be expected when face to face interviews are conducted. To avoid bias from the respondents, a self administered questionnaire was adopted as the most appropriate mode of data collection. The respondents were assured of anonymity and were urged to be as open as is possible. This enhanced the confidence that was derived from the results of the

research. Structured interviews were used to obtain further insight into the nature of unethical practices, benefits of technical auditing and efficacy of existing deterrents.

4.2.1 Layout

The questionnaire was developed with the main objective of the study in mind. The layout of the questionnaire was divided into four sections. Section A comprised general questions on the respondent and their organisations. Section B sought to showcase perceptions on the prevalence and preventive measures of unethical practices in the Zambian construction industry. Section C sought to have an insight of the overview of the Zambian construction industry through the experiences of the respondents. The questionnaire was capped with Section D which consisted questions pertinent to technical auditing. The questionnaire adopted closed-ended questions with a few provisions for open-ended questions to elicit any other additional relevant information from the respondents.

The flow chart in Figure 4.1 illustrates the structure of the questionnaire used for data collection. The questionnaire is reproduced in Appendix A4.

4.2.2 Pre-testing

The questionnaire went through a process of several reviews and a draft of the questionnaire was pilot-tested with three participants to ensure that questions were clear and unambiguous. The three companies that were involved in the pre-testing as shown in Appendix A.1. Pre-testing required that the questionnaire be field tested by sample participants or participant surrogates such as individuals with characteristics and backgrounds similar to the desired participants (Cooper and Schindler, 2003). Pre-testing was particularly important to establish whether:

- certain terms such as 'economic crimes' would be understood; and
- question sequence and arrangement was in order.

As a result of the pilot testing, minor changes were made to the hierarchy and the wording of certain questions, but the substantive document remained unchanged. The self administered questionnaire is reproduced in its entirety in Appendix A.4.

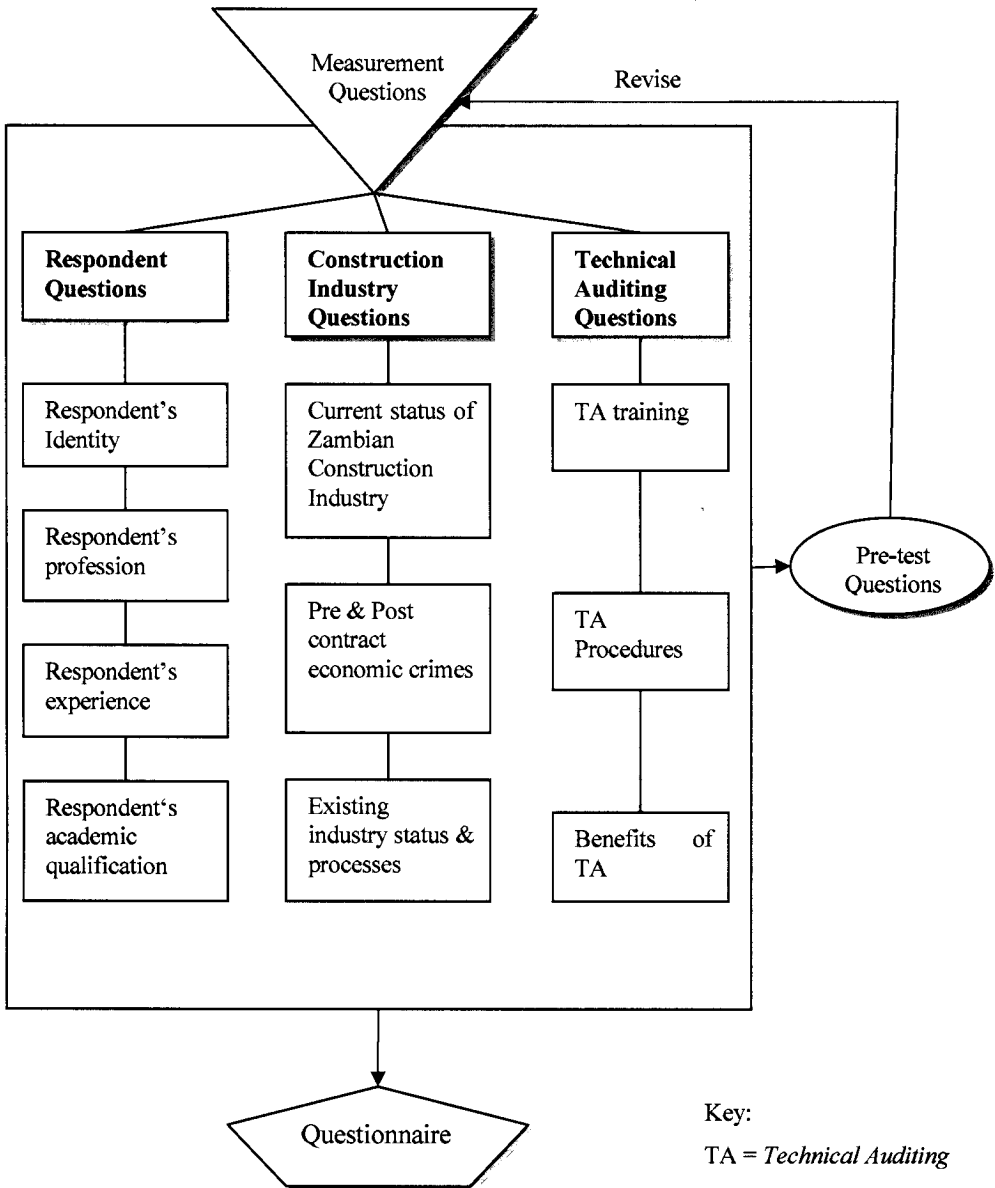


Figure 4.1: Flow chart for the self administered questionnaire

4.2.3 Sampling

The population sample was restricted to the construction industry and financial audit firms in Zambia using non-probability sampling. A judgemental sampling approach was used for the study, where participants were purposively selected to provide a representative sample in terms of the definition of the Zambian construction industry namely; consultancy, contractor, manufacturing, supply and clientele sectors. Auditing firms were also sampled to ascertain the capability of handling technical audits. In order to ensure that the sample was representative of the broader population, respondents were from five out of the nine provinces in the country although there were a slightly higher proportion of respondents from the urbanised provinces such as the Copperbelt and Lusaka provinces, which is broadly representative of the population as a whole. Sixty (60) questionnaires were distributed to various sectors in the Zambian construction industry as shown in Table 4.1. Details of the actual organizations involved in the survey are shown in Appendix A.2.

Table 4.1: Sampling per sector

S/No.	Sector	Qty
1.	Clientele	27
2.	Consultancy	14
3.	Contractor	5
4.	Manufacturing	4
5.	Supply	4
6.	Other (Auditing firms)	6
7.	Total	60

Though sampling was disproportionate stratification was employed to eliminate bias from any given sector with regards to their perceptions.

4.2.4 Response rate

Poor response rates usually reduce the intended sample size and lessen the confidence with which findings can be accepted and generalised. Cooper and Schindler (2003) stated that a cover letter is the most logical vehicle for persuading individuals to

respond, yet the few studies that are reported offer no insights as to its formulation. For this study, a cover letter was drafted to accompany the questionnaire, outlining the purpose of the survey, explaining certain terms such as technical auditing and requesting co-operation in completing the document. A sample of the cover letter is shown in Appendix A.3.

Over a period of seven weeks from January to February, 2008, questionnaires were administered and returned. A response rate of 82 per cent was achieved. There is no 'standard' for an acceptable response rate, but published opinion indicate that below 80 percent, bias is likely to occur and a response rate below 60 percent is 'barely acceptable' (Peninsula RDSU, 2003). A follow up letter could have been issued to increase the response rate but this was not done because it was felt that the seven weeks already given was adequate and that waiting for more responses would further delay the study. Cooper and Schindler (2003) stated that a high percentage of those who reply to a given survey have usually replied to others, while a large share of those who do not respond are habitual non-participants. This makes non-response error a major weakness of the self administered questionnaire. Nonetheless, the questionnaire survey results were complemented by interviews carried out with ten participants. Further enhancement of questionnaire results was achieved by inclusion of case studies of actual construction projects in the research programme.

4.2.5 Descriptive and inferential statistics

This study employed both descriptive and inferential statistics. Descriptive statistics simply describe what is or what the data shows whereas inferential statistics infer from the sample data what the population thinks (Trochim, 2006). In other words, inferential statistics make inferences from collected data to more general conditions.

Descriptive statistics were used to describe the basic features of the data in the study. A database was constructed on the basis of frequency tables used to perform a count against each question to discover the frequency of each response. A frequency table is

a simple device for arraying data (Cooper and Schindler, 2003). In addition, pie charts and bar graphs were used as common ways of displaying relative comparisons of nominal data. Percentages were used in data presentation in that they simplify and translate data to a standard basis for easy comparison.

Generally, there were two types of significance tests available for this study namely: parametric and non-parametric tests. Non-parametric tests were selected because this survey utilized nominal and ordinal measurement scales. Table 4.1 shows some commonly used non-parametric statistical tests.

Table 4.2: Some commonly used statistical tests

S/No.	Normal theory based test	Corresponding non parametric test	Purpose of test
1.	<i>t</i> test for independent samples	Mann-Whitney U test Wilcoxon rank-sum test	Compares two independent samples
2.	Paired <i>t</i> test	Wilcoxon matched pairs signed-rank test	Examines a set of differences
3.	Pearson correlation coefficient	Spearman rank correlation coefficient	Assesses the linear association between two variables.
4.	One way analysis of variance (<i>F</i> test)	Kruskal-Wallis analysis of variance by ranks	Compares three or more groups
5.	Two way analysis of variance	Friedman Two way analysis of variance	Compares groups classified by two different factors

The test of choice for the survey was the Mann-Whitney U test Wilcoxon rank-sum test. It is used to test whether two samples are drawn from the same population and is most appropriate when the likely alternative is that the two populations are shifted with respect to each other (Dallal, 2000).

For example, the pre- and post-contract economic crimes listed in Question 10 of the questionnaire involved ordinal measurement where the attributes were able to be

ranked. For ordinal data, the ranking of frequency of occurrence was done using the following formula (Muya, 1999):

$$FI = \left(\frac{\sum_1^5 R_i N_i}{5 \sum_1^5 N_i} \right) \times 100\%$$

where FI is the frequency index, R_i is the response type on the Likert scale, i ranging from 1 to 5 and N_i is the total number of respondents choosing response type i , with i ranging from 1 to 5 as earlier described. As an example of the above formula, FI was computed as follows:

$$FI = \left[\frac{R_5(N_5) + R_4(N_4) + R_3(N_3) + R_2(N_2) + R_1(N_1)}{5(N_5 + N_4 + N_3 + N_2 + N_1)} \right] \times 100$$

where N_5 = the number of respondents that answered ‘very common’ or ‘strongly agree’;
 N_4 = the number of respondents that answered ‘common’ or ‘agree’;
 N_3 = the number of respondents that answered ‘don’t know’ or ‘not sure’;
 N_2 = the number of respondents that answered ‘rare’ or ‘disagree’; and
 N_1 = the number of respondents that answered ‘very rare’ or ‘strongly disagree’

4.3 Data analysis

The analysis of data was done by listing down the responses to each question and noting the frequency of occurrence of the responses. The answers were then incorporated in the relevant sections of the analysed self administered questionnaire. From the distribution of the questionnaires to 60 respondents shown in Appendix A.2, the sampling was disproportionate to the five sectors. Therefore, the responses from the various respondents were stratified so as to eliminate bias from any given sector with regards to their perceptions. In order to achieve the required stratification, results from the consultancy, clientele, contractor, manufacturing and auditing profession

where multiplied by 0.51, 0.80, 1.11, 5.00, and 1.43 respectively as weighting factors. The weighting factors were obtained by dividing the requisite proportion of 20 percent that is 1 out of the 5 categories, for each category of respondents by its response rate. For instance, the consultancy sector's weighting factor, (WF), was calculated as follows:

$$WF = \frac{20\%}{39\%} = 0.51$$

4.3.1 Respondents' profiles

Information was provided under the guarantee that the names of the respondents would remain anonymous. In this section, nominal data comprised data on types of respondents and surveyed organisations. Independent variables in the form of profiles of the respondents had to be analysed to assess the type of people who were responding to the questionnaire. To determine whether the respondents were active in the construction sector, they were requested to state the name of the firm they worked for. All the firms stated were of organisations that were active in the Zambian construction industry as verified by the NCC contractor register as at December, 2007. Consultancy firms were verified through various professional bodies such as ACEZ, ZIA, SIZ and Eng-RB.

Figure 4.2 displays the percentage breakdown of respondents by management position. The majority of respondents at 53 percent belonged to middle management. Junior management accounted for 18 per cent while top management accounted for 29 per cent.

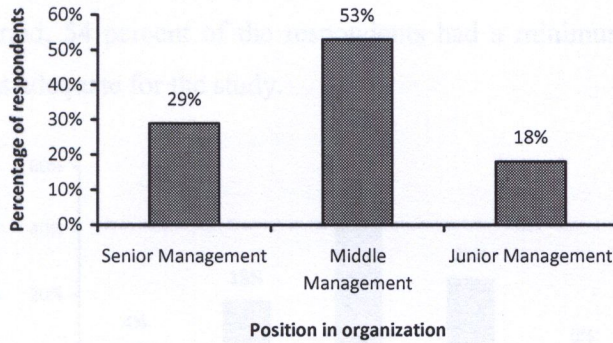


Figure 4.2: Percentage breakdown by type of respondents’ management position

With regards to the sector the respondents’ represented, none of them were from the supply sector. Thirty nine (39) percent of the respondents were from the consultancy sector while 25 were from the clientele sector, 18 from the contractor sector, 4 from the manufacturing sector and 14 from the auditing profession. Despite distributing the questionnaires to all identified sectors of the construction industry, no completed questionnaires were received from the supply sector. Figure 4.3 highlights the construction sector representation of the respondents.

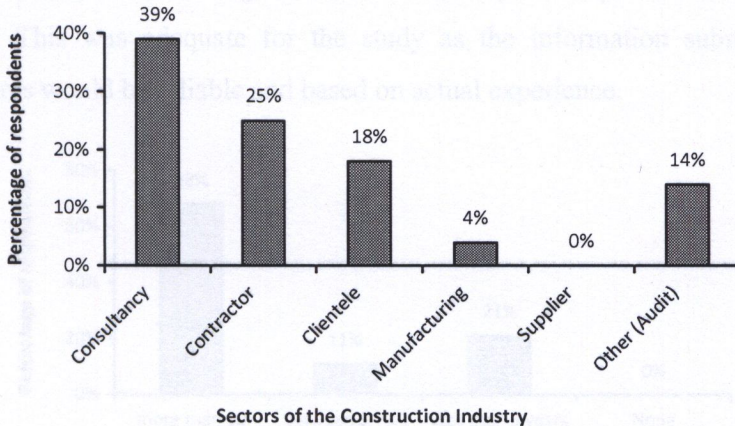


Figure 4.3: Percentage breakdown by type of respondents’ sector representation

Figure 4.4 shows the academic qualifications of the respondents. Although the qualifications varied, 54 percent of the respondents had a minimum of a bachelor's degree which was adequate for the study.

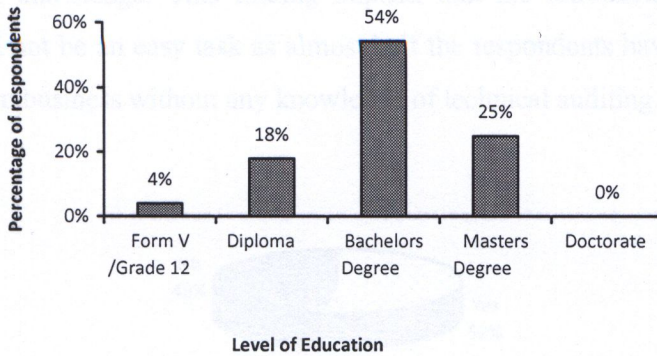


Figure 4.4: Percentage breakdown by type of respondents' academic qualifications

Apart from academic qualifications of respondents, another significant factor considered was their experience in the construction industry. All the respondents, including those in the accounting profession, had experience in the construction industry with 68 percent having had more than 10 years experience as indicated in Figure 4.5. This was adequate for the study as the information submitted in the questionnaires would be reliable and based on actual experience.

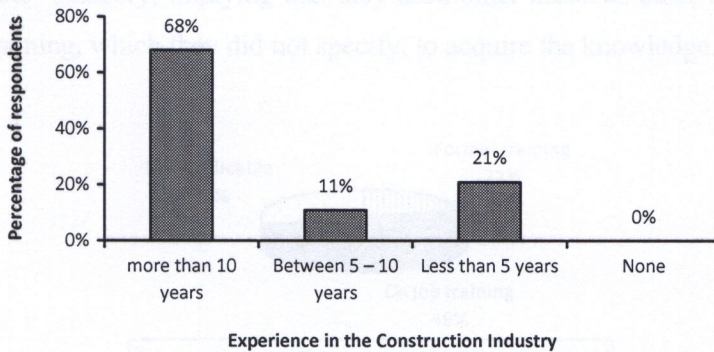


Figure 4.5: Percentage breakdown by length of respondents' experience in the construction industry

Although the survey revealed that most of the respondents had more than ten years experience, only 52 percent of the respondents had any knowledge of technical auditing. Figure 4.6 below shows that the remaining 48 percent did not have any technical audit knowledge. This finding implied that the introduction of technical auditing would not be an easy task as almost half the respondents have been carrying out construction business without any knowledge of technical auditing.

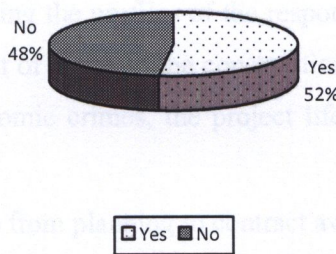


Figure 4.6: Percentage breakdown of respondents' knowledge of technical audit

Knowledge of technical auditing could be acquired through training. This training could be formal or on the job training. Figure 4.7 below shows that 48 percent of the respondents acquired their technical audit knowledge through on the job training while only 22 percent underwent formal training. The remaining 30 percent fell under the 'not applicable' category, implying that they used other methods other than formal or on-the-job training, which they did not specify, to acquire the knowledge.

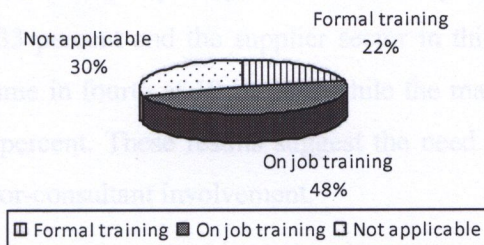


Figure 4.7: Percentage breakdown by type of respondents' technical audit training

By and large, the respondents were predominantly qualified middle or senior management personnel with at least 10 years experience within the construction industry in Zambia. The profiles and experiences of the respondents suggested sufficient exposure of the sampled population to construction processes to make the survey data a reliable basis for discussion and analysis of insights into construction industry practices in Zambia.

4.3.2 Perception of the Zambian construction industry

Having obtained data regarding the profiles of the respondents, the survey focused on what the respondents thought of ethics in the construction industry. To investigate this aspect with regards to economic crimes, the project life cycle was divided into two distinct categories:

- pre-contract stage, that is from planning to contract award; and
- post-contract stage which is the physical construction of the facility up to the end of the defects liability period.

The objective was to find out which types of economic crimes were prevalent in each stage. From the survey, general perceptions of ethics in the Zambian Construction industry were established and are highlighted below.

a) General information

According to the survey and as indicated in Figure 4.8, the contractor sector was perceived to be the most corrupt by 35 percent of the respondents, followed by the consultancy sector at 33 percent and the supplier sector in third place at 21 percent. The clientele sector came in fourth at 10 percent while the manufacturing sector was the least corrupt at 1 percent. These results suggest the need for stringent measures where there is contractor-consultant involvement.

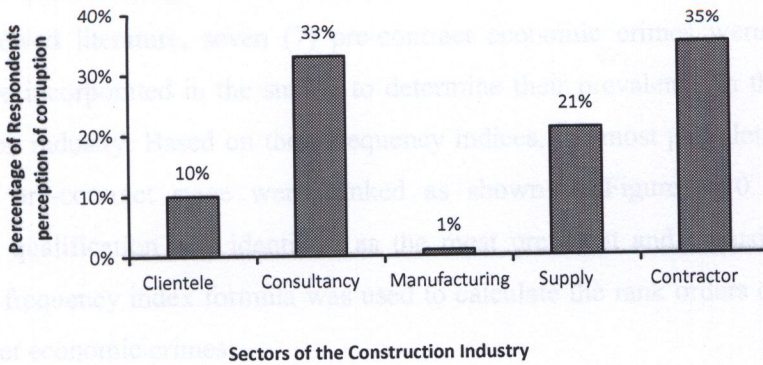


Figure 4.8: Percentage breakdown of corrupt sectors in the Zambian construction industry

When it came to who initiated economic crimes, Figure 4.9 illustrates that 37 percent of the respondents felt individuals were responsible compared to 13 percent for corporate entities. Economic crimes at corporate level usually involved senior management where the company as a whole benefited from the unethical practices. The majority of the respondents, 43 percent believed that both individuals and corporate entities initiated most of the corrupt activities.

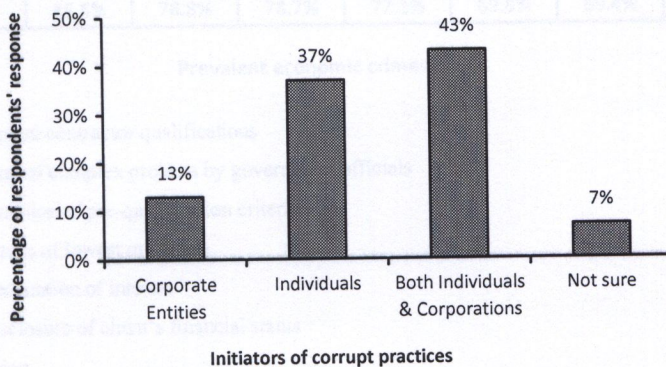
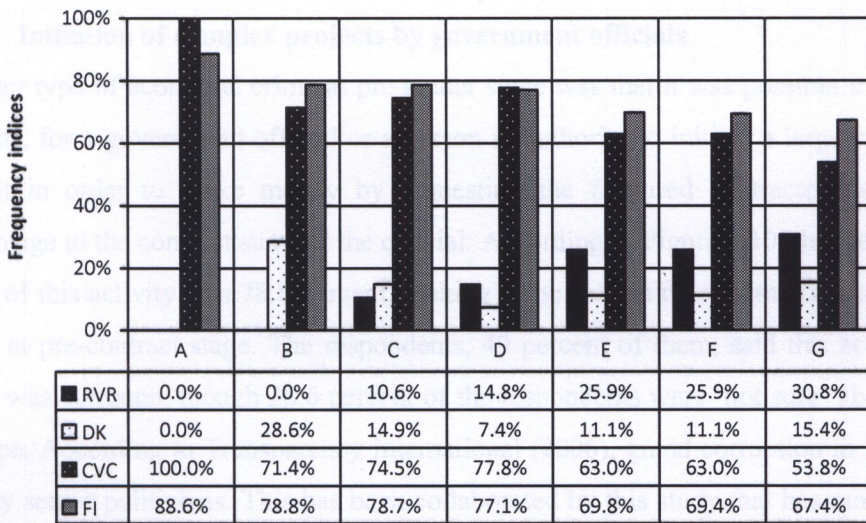


Figure 4.9: Percentage breakdown by type of initiators of economic crimes in the Zambian construction industry.

b) Pre-contract stage

From reviewed literature, seven (7) pre-contract economic crimes were identified. These were incorporated in the survey to determine their prevalence in the Zambian construction industry. Based on their frequency indices, the most prevalent economic crimes at pre-contract stage were ranked as shown in Figure 4.10. Contractor fraudulent qualification was identified as the most prevalent and collusion was the least. The frequency index formula was used to calculate the rank orders of the seven pre-contract economic crimes.



Prevalent economic crimes

A- Fraudulent contractor qualifications

B-Initiation of complex projects by government officials

C-Manipulation of pre-qualification criteria

D-Disclosure of lowest quotation

E-Non declaration of interest

F-Non disclosure of client’s financial status

G-Collusion

RVR- Rare to Very rare; DK-Don’t Know; CVC- Common to Very Common; FI-Frequency Index

Figure 4.10: Frequency indices of prevalent economic crimes at pre-contract stage

i) Fraudulent contractor qualifications

All the respondents agreed that fraudulent qualifications by contractors regarding plant and equipment, labour and company qualifications in order to get contracts was very common. With a frequency index of 88.9 percent as shown in Figure 4.10, the respondents were certain that this practice took place with all the respondents saying it was a 'common' to 'very common' activity in the industry. If unchecked this practice could become entrenched in the procurement system. In other words, it would become institutionalised and thus accepted as a way of doing business.

ii) Initiation of complex projects by government officials

Another type of economic crime at pre-tender stage was that it was possible in public projects, for a government official or a person in authority to initiate a large complex project in order to make money by requesting the favoured contractor to add a percentage to the contract sum for the official. According to Figure 4.10, the frequency index of this activity was 78.8 percent, making it the second most common economic crime at pre-contract stage. The respondents, 49 percent of them, said this economic crime was common, though 28.6 percent of the respondents were 'not sure' about this practice. According to Transparency International (2006), grand corruption in Zambia was by senior politicians. This has been collaborated by this study that has ranked the practice as the second most prevalent economic crime at pre-contract stage. One way this practice could be minimised would be to ensure that only budgeted public projects were initiated.

iii) Manipulation of pre-qualification criteria

The possibility of consultants manipulating the pre-qualification of contractors in order for the preferred contractor to win the contract was a reality in the Zambian construction industry. This economic crime had a frequency index of 78.7 percent as shown in Figure 4.10, indicating that this was the third most prevalent economic crime at pre-tender stage. At 74.5 percent it was felt that this practice was common to very common with 14.9 percent indicating they were not sure about the practice while 10.6

percent said that the practice was rare to very rare. In such cases, the procuring party would specify pre-qualification conditions with a particular contractor in mind. Once again, the procuring entity might not have sufficient knowledge in the procuring process, leaving the procurement to an individual in the organisation or to a consulting firm who would tailor the process to suit their intentions knowing checks and balances were lacking. This practice could be prevented or minimised by ensuring that procurement guidelines that are in place are strictly adhered to.

iv) Disclosure of lowest quotation

In this case, detail of the lowest quotation would be communicated by the entity reviewing the quotations to the preferred contractor in order for that contractor to quote lower and win the bid. The frequency index of this activity was 77.1 percent placing it in fourth position. At 77.8 percent, the respondents felt this was a ‘common’ to ‘very common’ practice. Those that were ‘not sure’ accounted for 7.4 percent and the remaining 14.8 percent felt it was a ‘rare’ to ‘very rare’ practice. This practice was common in projects where a formal system for the procurement of services and goods was lacking. One way to minimise this vice was to ensure that procurement guidelines were put in place and implemented accordingly.

v) Non declaration of interest

The practice of consultants or owners not disclosing their interest in companies that were tendering for a contract was another prevalent unethical practice. With a frequency index of 69.8 percent, the majority of the respondents 63 percent felt this was a common practice compared to 25.9 percent who said it was a ‘rare’ to ‘very rare’ practice.

vi) Non disclosure of client’s financial status

Non disclosure of the client’s financial status becomes an economic crime when contractors utilize their assets as collateral on potentially problematic projects. With a frequency index of 69.4 percent, this activity was ranked the sixth most prevalent

economic crime. In such cases, the client would be aware that if their financial difficulties were disclosed, the contractor would not commence work. The majority of the respondents at 63 percent felt that this was 'common' compared to 25.9 percent who felt that this was a 'rare' practice.

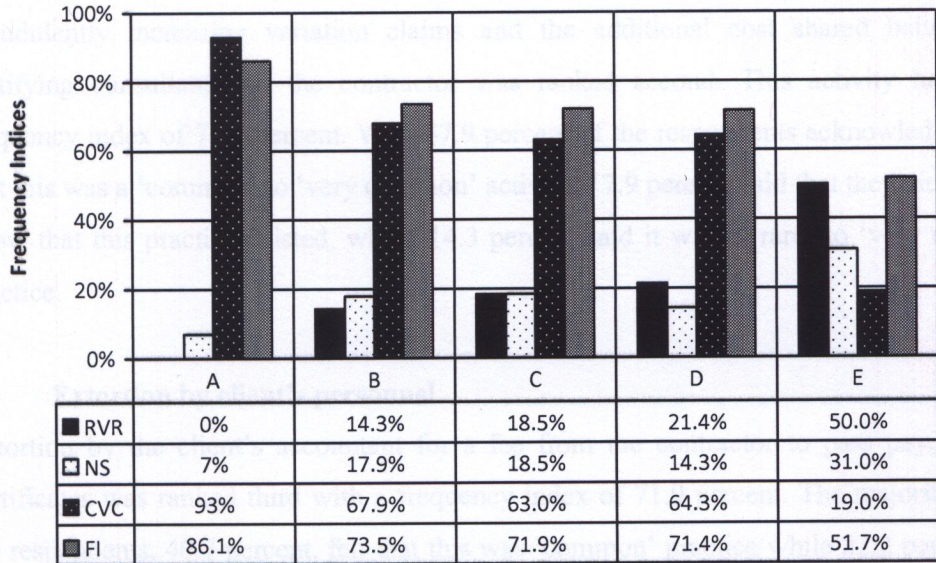
vii) Collusion

Collusion, also known as bid rigging, with a frequency index of 67.4 percent was ranked seventh. Collusion was found to be the least prevalent pre-contract economic crime in the Zambia construction industry. Though 53.8 percent of the respondents found collusion to be 'common' to 'very common' at tender stage, 30.8 percent of the respondents thought it was 'rare' to 'very rare' for contractors to collude. The study revealed that collusion, the least ranked economic crime was not as prevalent in the Zambian construction industry compared to the UK where the Office of Fair Trading (OFT) suspected 112 construction companies of bid-rigging that could have pushed up construction prices by about 10 percent (Sweet, 2008). The low ranking of this economic crime could be attributable to the fact that the Zambian construction industry has been experiencing growth with sufficient contracts for the various players in the industry.

All the malpractices in the pre-contract stage scored frequency indices above 50 percent implying that they were all quite prevalent.

c) Post-contract stage

Figure 4.11 shows the ranking of prevalent economic crimes during the construction phase. Considering the frequency indices, the most prevalent unethical practice was the supply and use of inferior and cheap construction materials, with the contractor and consultant conniving to share the resulting financial benefits. The least ranked post-contract economic crime was the delayed issuance of payment certificates. Delayed certification was detrimental to the owner because the overall cost of the project could increase in the end.



Prevalent economic crimes

A-Supply of inferior quality materials

B-Increased variation claim

C-Extortion by client’s personnel

D-False certification of works

E-Delayed issuance of payment certificates

RVR- Rare to Very rare; NS-Not Sure; CVC- Common to Very Common; FI-Frequency Index

Figure 4.11: Frequency indices of prevalent economic crimes at post-contract stage

i) Supply of inferior quality materials

Topping the list of post-contract economic crimes was the prevalence of contractors supplying inferior quality materials and being paid for good quality materials. With a frequency index of 86.1 percent, this economic crime entailed the contractor and the certifying consultant collaborating and sharing the difference. Though 7 percent of the respondents stated that they did not know that the above practice existed, the remaining 93 percent of the respondents said that the practice was ‘common’ to ‘very common’.

ii) Increased variation claims

Fraudulently increasing variation claims and the additional cost shared between certifying consultant and the contractor was ranked second. This activity had a frequency index of 73.5 percent. With 67.9 percent of the respondents acknowledging that this was a 'common' to 'very common' activity, 17.9 percent said that they did not know that this practise existed, whilst 14.3 percent said it was a 'rare' to 'very rare' practice.

iii) Extortion by client's personnel

Extortion by the client's accountant for a fee from the contractor to pass payment certificates was ranked third with a frequency index of 71.9 percent. The majority of the respondents, 40.7 percent, felt that this was 'common' practice while 22.2 percent emphasized that it was 'very common'. The respondents that did not know about the practise accounted for 18.5 percent while 14.8 percent indicated that it was 'rare' and 3.7 percent stated that it was 'very rare' practice.

iv) False certification of works

Quantity surveyors falsely increasing quantities of certified works to fraudulently obtain money from the contractors, ranked fourth, with a frequency index of 71.4 percent. Though 64.3 percent of the respondents stated that this was a 'common' to 'very common' practice, 14.3 percent did not know about this practice and 21.4 percent felt that this was a 'rare' to 'very rare' activity.

v) Delayed issuance of payment certificates

The least familiar economic crime was the possibility of the client bribing the consultant to delay issuance of a payment certificate because the owner did not have sufficient funds at the time. This was reflected by the low frequency index of 51.7 percent. The majority of the respondents, 50 percent said that this was a 'rare' occurrence with 31 percent stating that they did not know that the activity took place. The reason for this could be that the effect of delaying certification would be

detrimental to the client because the overall cost of the project could increase as a consequence of such an action.

Once again all the identified post-contract unethical practices scored frequency indices above 50 percent, an indication that they were quite prevalent in the Zambian construction industry.

From the frequency indices for pre- and post-contract economic crimes, it appeared that the pre-contract stage was more susceptible to unethical practices than post-contract activities. Therefore stringent strategies to prevent unethical practices that include technical auditing need to be implemented in the pre-contract phase, particularly during the planning stage.

d) Existing regulations

The previous section examined the common economic crimes at both pre and post-contract stages. There are existing regulations in different construction industries in the world and the common ones were examined to establish whether they could assist in minimising economic crimes in the Zambian construction industry. International financiers such as the World Bank have used contractor blacklisting and consultant de-registration to penalize corrupt bidders. For example, Canadian hydroelectric engineering firm, Acres International was barred for three years following its conviction for bribery in connection with the Lesotho Highlands water project by Lesotho courts and AB Hidrostatyba and AB Panevezio Statybos Trestas, two Lithuanian companies were debarred following accusations of collusion in bidding for a US\$3.28 million contract for the expansion of water supply and waste water networks as part of the Klaipeda Environmental Project (Allen, 2006). In addition, the 112 construction companies identified for involvement in bid-rigging by OFT in the UK feared that they could be blacklisted by local authorities from their tender lists after their case is determined (Sweet, 2008).

The survey assessed the acceptability of the above punitive measures as deterrents of unethical practices in construction. It was confirmed that blacklisting or de-registration of contractors and consultants would be acceptable deterrents of unethical practices in the industry. Contractor blacklisting received an 86 percent endorsement, while consultant de-registration was supported by 89 percent of the respondents shown in Figure 4.12. The high score endorsements of the deterrents can be interpreted as reliable indication of the acceptability of the strategies to reduce unethical practices in construction.

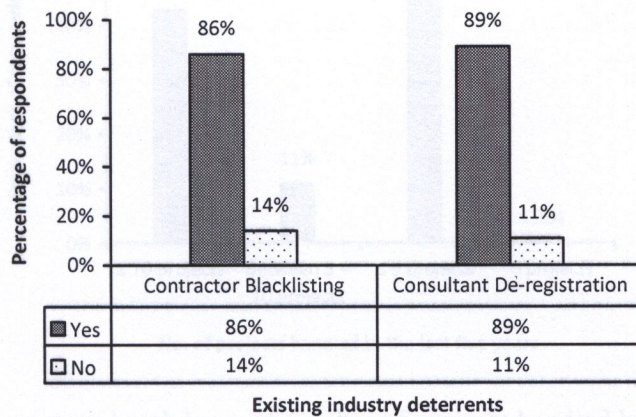


Figure 4.12: Acceptability of punitive measures to minimise economic crimes in the construction industry

4.3.3 Overview of construction works

To gain more insight into economic crimes in the *Zambian* construction industry, it was appropriate to focus on actual construction projects. As stakeholders, the respondents were requested to share their experiences with regards to actual construction projects they had handled and explore the possibility of the economic crimes discussed earlier affecting the delivery of construction projects. Therefore, the objective of this section of the questionnaire was to examine the general delivery of construction projects with regards to quality, cost and time.

a) General trend

Considering the previous five years, all respondents were involved in construction projects with 46 percent involved in less than five projects, 11 percent were involved in five to ten projects and 43 percent in more than ten projects. The results highlighted in Figure 4.13 were adequate for the study to come up with general perceptions regarding ethics in the Zambian construction industry.

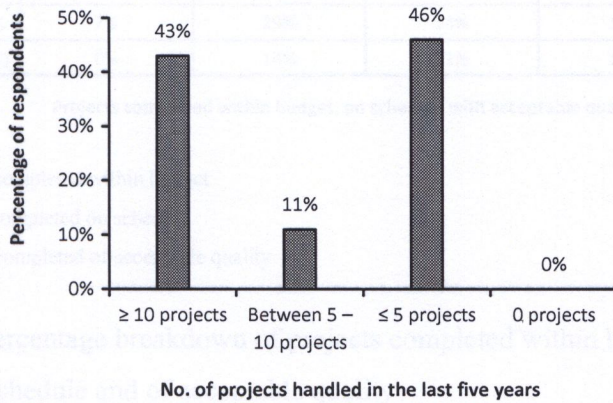
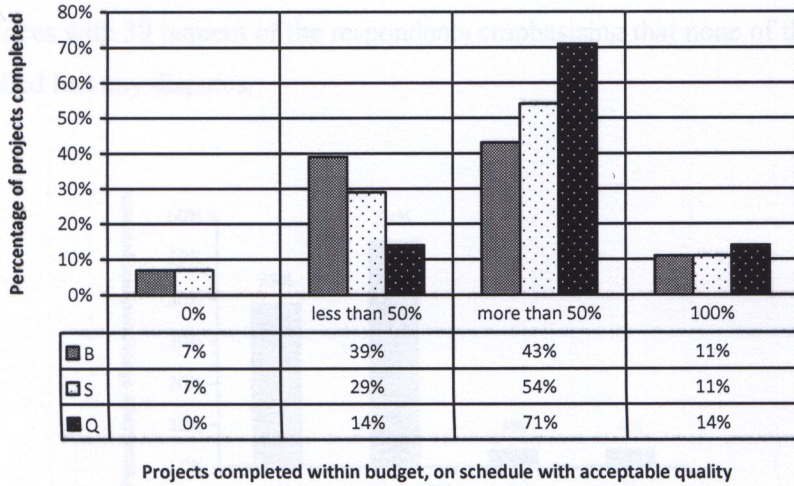


Figure 4.13: Percentage breakdown of number of projects handled by respondents in the last five years

From Figure 4.14 the general trend was summarised as follows:

- more than half of the projects handled were of acceptable quality as indicated by 71 percent of the respondents;
- more than half of the projects handled were completed on time as stated by 54 percent of the respondents; and
- 43 percent of the respondents stated that more than half of the projects they handled were completed within budget.



- B-Projects completed within budget
- S-Projects completed on schedule
- Q-Projects completed of acceptable quality

Figure 4.14: Percentage breakdown of projects completed within budget, on schedule and of acceptable quality

Figure 4.15 illustrates that of the projects handled by the respondents in the previous five years 64 percent state that less than half of the projects remained incomplete while 32 percent of the respondents did not have any incomplete projects.

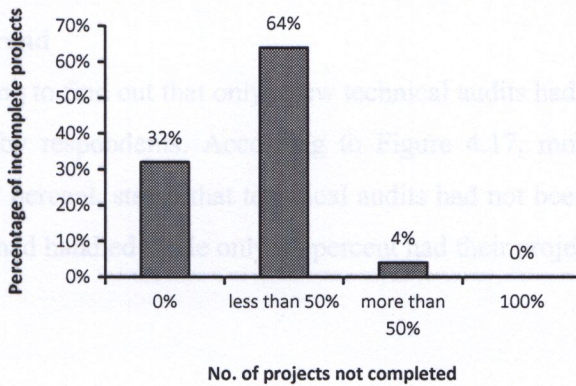


Figure 4.15: Percentage breakdown of incomplete projects

Figure 4.16 shows that very few of the incomplete projects had disputes or legal consequences with 39 percent of the respondents emphasising that none of the projects they handled had any disputes.

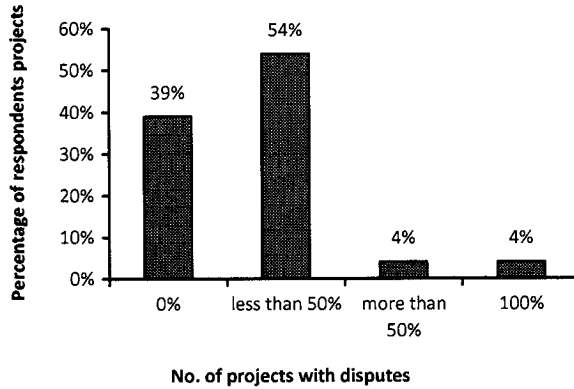


Figure 4.16: Percentage breakdown of incomplete projects with disputes

4.3.4 Technical auditing

The last section of the questionnaire survey dealt with actual technical auditing. It sought to establish who had experience with technical auditing and the capacity of the existing financial auditors to carry out technical audits. The main objective of this section was to establish and assess the benefits of technical auditing.

a) General trend

It was not surprising to find out that only a few technical audits had been carried out on projects handled by respondents. According to Figure 4.17, more than half of the respondents, at 57 percent, stated that technical audits had not been carried out on the projects that they had handled while only 43 percent had their projects audited.

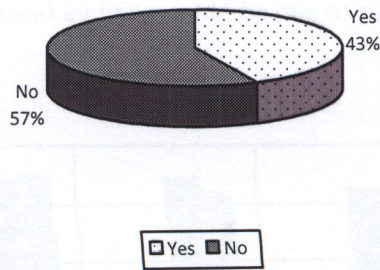


Figure 4.17: Percentage breakdown of projects subjected to technical audits

Of the projects that had been audited, 29 percent of the audits had been carried out by traditional accountants followed by architects and quantity surveyors both at 24 percent as shown in Figure 4.18. Engineers followed at 18 percent. This finding confirmed the fact that majority of audits carried out were financial audits.

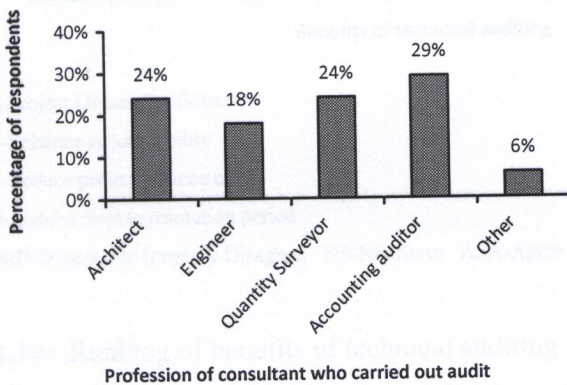
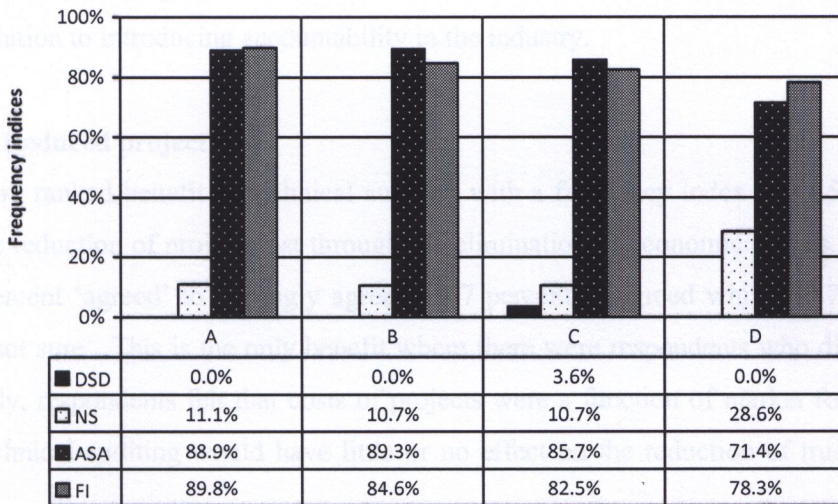


Figure 4.18: Percentage breakdown of type of consultants that performed construction project audit

b) Ranking of technical audit benefits

Among the numerous identified benefits of technical auditing, the four most important ones in rank order are shown in Figure 4.19. Client confidence, enhanced accountability, reduced project costs and reduced dispute resolution periods were

identified to be the major benefits in that order of importance. With client confidence and accountability for public resources at their lowest levels in the Zambian construction industry, technical auditing could be one of the solutions to bringing back integrity into the industry.



Benefits of technical auditing

A-Project Owner Confidence

B-Enhance accountability

C-Reduce project finance costs

D-Reduce dispute resolution period

DSD-Disagree to Strongly Disagree; NS-Not Sure; ASA-Agree to Strongly Agree; FI-Frequency Index

Figure 4.19: Ranking of benefits of technical auditing

i) Client confidence

Client confidence ranked highest in the survey with a frequency index of 89.8 percent as shown in. Apart from the 11.1 percent that were ‘not sure’, the remaining respondents at 88.9 percent ‘agreed’ and some ‘strongly agreed’ that clients would be satisfied that they were getting value for money if a technical audit was done. Perhaps this ranked highest because client confidence is lacking in the Zambian construction industry.

ii) Enhanced accountability

The second ranked benefit with a frequency index of 84.6 percent was that technical auditing would enhance accountability. The survey revealed that 89.3 percent 'agreed' to 'strongly agreed' against 10.7 percent who were not sure. Once again with accountability lacking in the Zambian construction industry, technical auditing would be a solution to introducing accountability in the industry.

iii) Reduced project costs

The third ranked benefit of technical auditing with a frequency index of 82.5 percent was the reduction of project cost through the elimination of economic crimes. Though 85.7 percent 'agreed' to 'strongly agreed', 3.7 percent disagreed whilst 10.7 percent were 'not sure'. This is the only benefit where there were respondents who disagreed. Probably, respondents felt that costs of projects were a function of market forces and that technical auditing would have little or no effect on the reduction of true project costs.

iv) Reduced dispute resolution periods

The low ranking of reduced dispute resolution periods with a frequency index of 78.3 percent was an unexpected finding. Though 71.4 percent agreed with this benefit, 28.6 percent were 'not sure'. The reason for this could be that results from the survey shown in Figure 4.16 earlier revealed that very few of the incomplete projects had disputes.

The questionnaire survey revealed that the client benefited more from technical audits. Therefore, it followed that the client should meet the cost of technical audits. This is confirmed by Figure 4.20 which shows that 79 percent of the respondents felt that the client should meet the cost of technical auditing services while 4 percent felt that it should be the contractors' responsibility, while 11 percent would rather the cost was met by both the client and contractor and 7 percent were not sure on who should meet the cost.

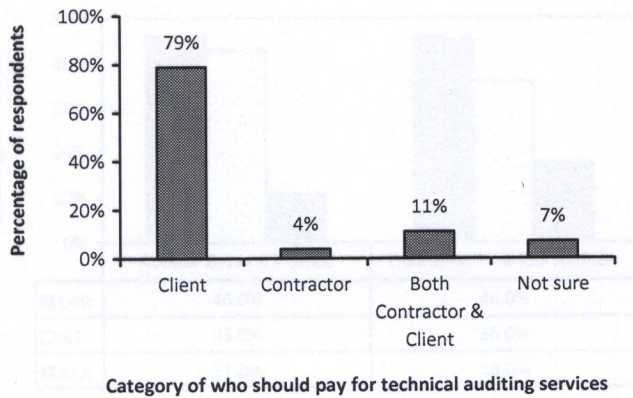
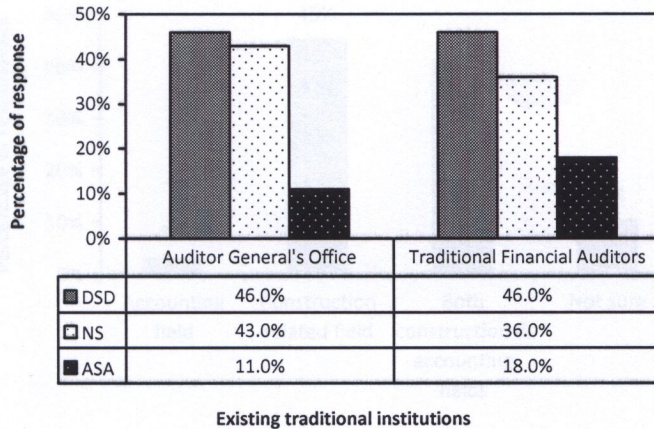


Figure 4.20: Percentage breakdown of who should meet technical audit cost

c) Existing institutions

After considering the benefits of technical auditing, the survey sought to establish whether traditional institutions with the mandate to audit public construction projects had the capacity to carry out this function. One such organisation in Zambia is AGO. The survey, as shown in Figure 4.21 revealed that 46 percent of the respondents indicated that AGO had no capacity to carry out technical audits, where as 11 percent thought AGO had capacity and 43 percent were not sure. Because of the high percentage of respondents unfamiliar with AGO capacity, further investigations would be required to establish the capability of AGO to undertake technical audits of construction projects. This was also the case with traditional auditing firms (TAFs) in Zambia, where 36 percent of the respondents were not sure about the capacity of TAFs to carry out technical audits. However, the majority, 46 percent of the respondents indicated that TAFs had no capacity compared to 18 percent who thought they did as indicated in Figure 4.21.



DSD-Disagree to Strongly Disagree; NS-Not Sure; ASA-Agree to Strongly Agree;

Figure 4.21: Percentage breakdown of perceived capacity by AGO and TAF to undertake technical audits

d) Recommended background of technical auditors

From the survey it was established that existing institutions with the mandate to carry out technical audits were perceived not to have capacity to carryout this function. Therefore, the study examined the type of training that would be appropriate for those who should carryout such audits. From Figure 4.22, 45 percent of the respondents felt that technical auditors should have construction related backgrounds compared to 3 percent who felt that auditors should have an accounting background. Though 10 percent were not sure, 41 percent preferred technical auditors with both construction and accounting backgrounds. In the absence of technical auditors with both construction and accounting related backgrounds, the concept of traditional accounting auditors collaborating with experts from the construction industry to form joint ventures for the sole purpose of executing technical audits should be considered for the time being and embraced as acceptable.

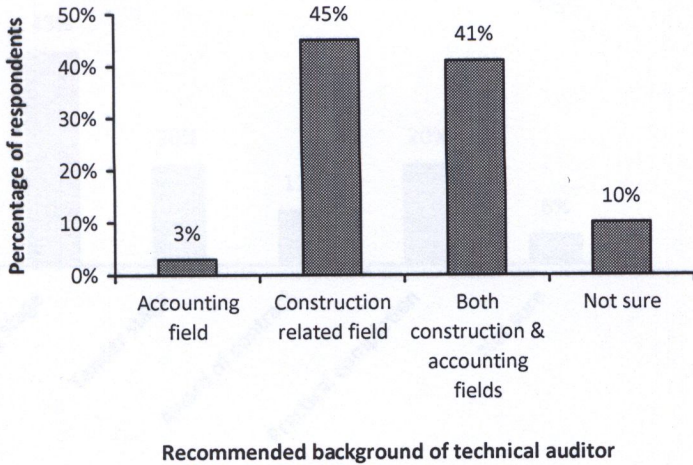


Figure 4.22: Percentage breakdown of recommended technical auditors' professional background

e) Technical audit procedure

Technical audit procedures such as point of audit entry, appointment of technical auditor and mandatory auditing regulations that could be incorporated in contracts in the Zambian construction industry were also investigated.

i) Appointment stage of a technical auditor

Results indicated that 43 percent of the respondents preferred the appointment of a technical auditor at the planning stage of the project life-cycle, while 20 percent had their preference at tender stage and the same percentage at the practical completion stage. The contract award stage was preferred by 11 percent of the respondents while 6 percent were not sure at which stage of the project life-cycle technical auditors should be appointed. Figure 4.23 shows the results.

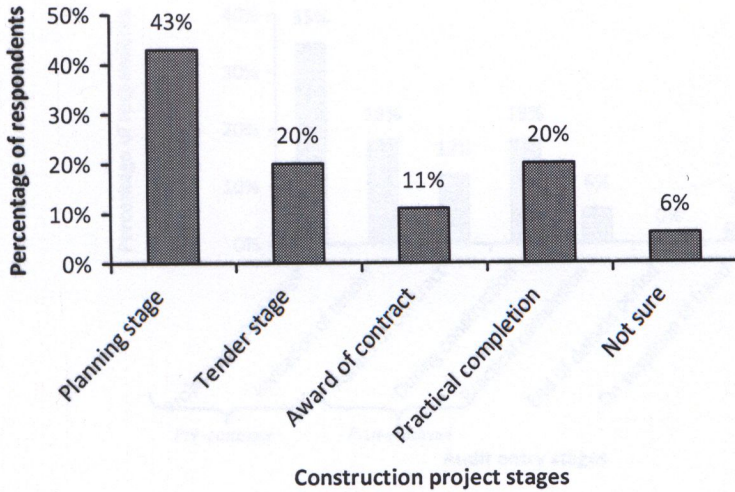


Figure 4.23: Percentage breakdown of when during project lifecycle should technical auditors be appointed

ii) Audit entry

As to when the audit should commence, Figure 4.24 indicates that 65 percent of the respondents stated that audit commencement should be at the pre-contract stage compared to 24 percent who thought post-contract commencement was more appropriate. Only 3 percent felt audit entry should be triggered by suspicion of fraud while 9 percent were not sure. From these results, commencement of a technical audit at the planning stage would be more effective in taking care of pre-contract economic crimes as well as those in the post-contract phase.

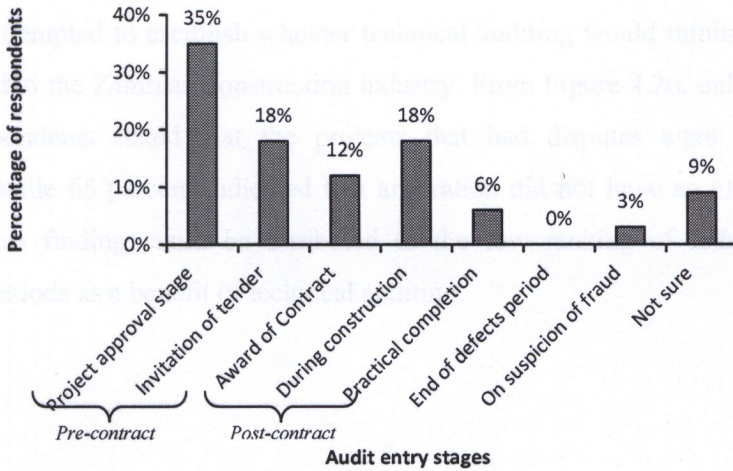


Figure 4.24: Percentage breakdown of audit entry stages

iii) The technical audit requirement

To institute the technical audit procedure, it was pertinent to ensure that the conditions of contract include a clause on the requirement of a technical audit being executed at least once during the lifetime of a project. Figure 4.25 shows that all the respondents, apart from 14 percent who were not sure, felt that the conditions of contract should include a clause on the requirement of a technical audit being executed at least once during the project lifecycle.

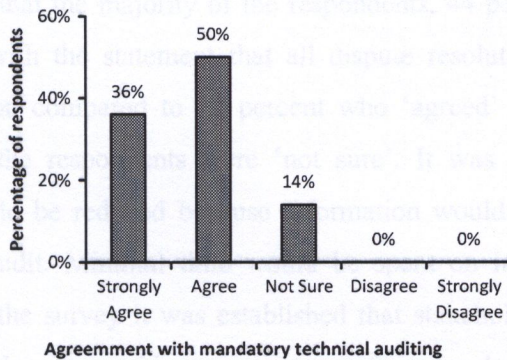


Figure 4.25: Percentage breakdown of levels of agreement with mandatory technical auditing

f) Dispute resolution

The study attempted to establish whether technical auditing would minimise cases of disputes within the Zambian construction industry. From Figure 4.26, only 35 percent of the respondents stated that the projects that had disputes were resolved by arbitration while 65 percent indicated that arbitration did not have an effect on their projects. This finding could be attributed to the low ranking of reduced dispute resolution periods as a benefit of technical auditing.

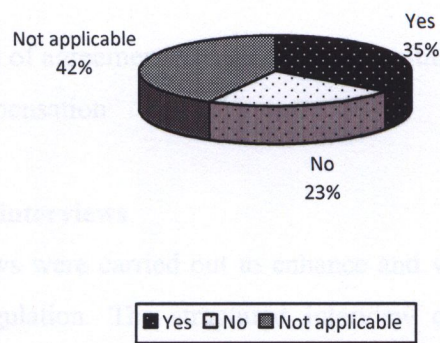


Figure 4.26: Percentage breakdown of projects that had disputes that were resolved by arbitration

Figure 4.27 indicated that the majority of the respondents, 44 percent, 'disagreed' or 'strongly disagreed' with the statement that all dispute resolution actions result in monetary compensation compared to 37 percent who 'agreed' or 'strongly agreed' while 19 percent of the respondents were 'not sure'. It was felt that the dispute resolution period would be reduced because information would be readily available through a technical audit. Minimal time would be spent on investigating areas of contention. But from the survey it was established that stakeholders in the Zambian construction industry do not consider consequences from legal disputes as a priority when administering contracts. This was also evident from results in Figure 4.19 which

showed the low ranking of reduced dispute resolution periods as a benefit of technical auditing.

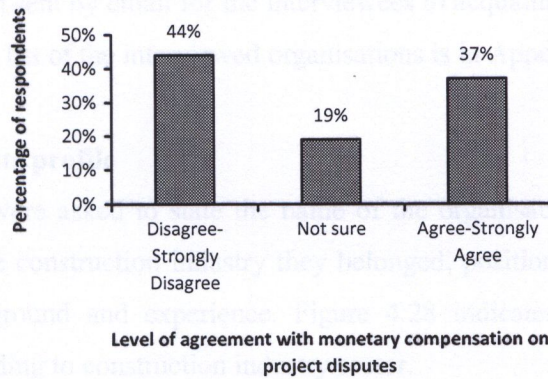


Figure 4.27: Level of agreement that all dispute resolution result in monetary compensation

4.4 Structured interviews

Structured interviews were carried out to enhance and verify questionnaire results as part of data triangulation. The structured interview designed to complement the questionnaire had a layout similar to the questionnaire. It included:

- respondents' questions directed at gathering interviewees details such as organisation name, type of business activity, position in the organisation and experience in the construction industry;
- questions concerned with interviewees perception of ethics in the Zambian construction industry and what could be done with the unethical practices; and
- questions regarding technical auditing such as whistle blowing systems, blacklisting and de-registration of consultants.

The structured interview questions are reproduced in Appendix B.1. The ten (10) interviewed organisations were part of those targeted in the self administered questionnaire. Though the sample size was small it encompassed all the key players in the Zambian construction industry and provided an indicative feedback on the

prevailing situation in the industry. Interviewees were first contacted by telephone to introduce and explain the format of the interview. The designed structured interview questions were then sent by email for the interviewees to acquaint themselves with the subject matter. The list of the interviewed organisations is in Appendix B.2.

4.4.1 Respondents profile

The interviewees were asked to state the name of the organisation they worked for, which sector of the construction industry they belonged, position in the organisation, professional background and experience. Figure 4.28 indicates the distribution of interviewees according to construction industry sector.

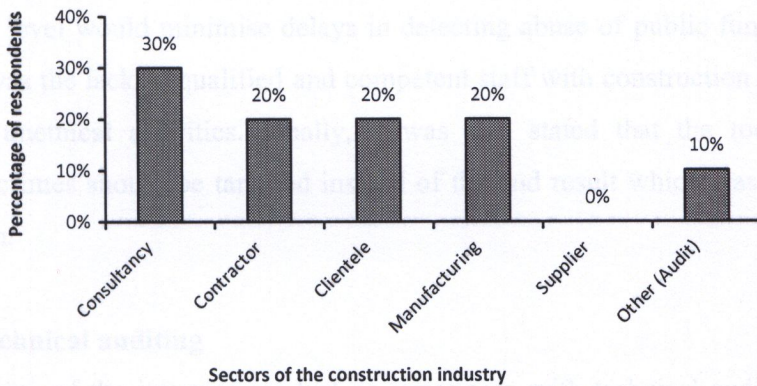


Figure 4.28: Percentage breakdown by type of respondents' sector representation

Of the interviewees, three (3) were in middle management positions while seven (7) were in senior management positions. All of them had construction background with experience ranging from 12 to 24 years. The experience of the respondents suggested sufficient exposure to construction processes to make the data collected a reliable basis for discussion and analysis of insights into construction industry practices in Zambia.

4.4.2 Perception of the **Zambian construction industry**

All of the interviewees agreed that there were unethical activities present in the Zambian construction industry. Suggested strategies for the prevention of unethical

practices included enhanced transparency through promotion of open tendering and independent monitoring of projects. It was observed that this could be achieved through mandatory technical auditing.

The interviewees felt that consultants providing sub-standard services could be regulated through professional bodies adopting a consistent approach in how they deal with such cases. Professional bodies should screen their members and raise awareness amongst members on what constitutes unethical practice.

Interviewees indicated that the problem with the perceived lack of capacity of the AGO's office was that it was not decentralised. Decentralisation of AGO's office to provincial level would minimise delays in detecting abuse of public funds. Another problem was the lack of qualified and competent staff with construction background to detect unethical activities. Finally, it was also stated that the root cause of unethical crimes should be targeted instead of the end result which was what AGO focused on.

4.4.3 Technical auditing

Though some of the interviewees had no experience with technical auditing, all the interviewees indicated that a technical audit was best performed by a technical team in the specified field being audited. As such interviewees felt that consultant and construction teams could establish teams that could undertake technical audits.

Interviewees suggested that some of the audit guidelines should include impartiality, clear terms of reference, risk management tools and a provision for undertaking technical audits at every stage of the project.

Benefits of technical auditing mentioned by the interviewees included efficiency, accountability, highlighting project failures and omissions, improved utilization of

resources, improved supervision and value for money. The stated benefits confirm those from literature review and the questionnaire survey.

Finally, all the interviewees except one, who was not sure, stated that they would recommend introduction of whistle blowing systems specifically for the Zambian construction industry. However, the caution was that pursuing whistle blowing 'reports' would be costly and filtering malicious reports would not be an easy task. To introduce a whistle blowing system in Zambia would require the government to pass legislation to protect whistle blowers such as a Public Interest Disclosure Act which is currently non-existent.

4.5 Summary

In this chapter, data collected through questionnaire survey and structured interviews was presented and analysed. The survey revealed that the contractor sector was the most corrupt in the construction industry in Zambia. The most prevalent unethical practice at pre-contract stage was established to be the presentation of fraudulent claims regarding contractors' equipment, labour and companies' qualifications. During the construction phase, the most prevalent unethical practice was the supply and use of inferior and cheap construction materials, while the least ranked post-contract economic crime was the delayed issuance of payment certificates. From the frequency indices for pre- and post-contract unethical practices, it appeared that the pre-contract stage was more susceptible to unethical practices than post-contract activities making appointment of a technical auditor and audit commencement at the planning stage appropriate. Respondents exhibited little faith in the capability of traditional audit institutions carrying out technical audits, and exposing and preventing unethical practices in the Zambian construction industry. It was evident that economic crimes were perpetuated by both consultants, representing clients and contractors.

One weakness the survey revealed was that stakeholders were least worried about issues relating to project disputes and their resolution. Finally, respondents advocated

for pro-activity through mandatory technical auditing as opposed to reactive auditing as there was a perception that individuals were less likely to get involved in unethical practices if there was a chance that such misdemeanours could be discovered. In the next chapter, findings of the survey are further examined via three case studies.

Chapter Five: Case studies

5.1 Introduction

In the previous chapter, the results of the structured interviews and self administered questionnaires were presented. Benefits of technical auditing and whether technical auditing could help to prevent economic crimes from occurring were analysed. From the research methodology in chapter three, case studies were highlighted as a research tool that would be used in this study. Case studies provide comprehensive examination of issues because they draw from actual experiences and practices. In this chapter, three case studies were reviewed:

- the Lusaka – Chirundu road an on-going project funded by the World Bank;
- the Presidential Housing Initiative (PHI), one of the major construction projects to be audited by the Auditor General's Office; and
- the rehabilitation and enhancement of the Mukuni Park and its facilities in Livingstone a project under the Support to Economic Expansion and Diversification (SEED).

5.2 Case studies

The subject of corruption and unethical practices is considered sensitive and information is normally concealed. Consequently, the willingness of clients to subject their projects to scrutiny determined which case studies were selected. Some donor agencies that were approached were not willing to give information on proposed case studies because clearance had to be obtained from their respective governments. This proved to be bureaucratic. For instance, the Danish International Development Agency (DANIDA) as financiers of the proposed construction of a hospital in Shangombo, Zambia which had caused public concern at that time was approached to obtain authority to utilize the project as a case study. To date approval has not been granted.

The World Bank, Zambia Office as financiers of various road projects was approached but referred requests for case study approval to the Road Development Agency (RDA). The Mongu-Kalabo road had caused massive public outcry. National Council for Construction (NCC) (2002) stated that the Mongu-Kalabo road simply had to be reconstructed rather than rehabilitated as there was no road to rehabilitate or let alone talk about. Given the very

expensive nature of constructing in sandy conditions the province should have been given more funds than other provinces (National Council for Construction, 2002). Figure 5.1 shows a section of the road after it was washed away by rains.



The Mongu –Kalabo Road is almost non existent

Figure 5.1: The Mongu-Kalabo Road

(After NCC, 2002)

When this road was identified as a case study authority was not granted because it was felt that the project was too sensitive and would create unnecessary political tension. The RDA instead recommended three roads namely:

- a) Chingola – Kasumbalesa road;
- b) Lusaka – Chirundu road; and
- c) Kafulafuta – Luanshya road co-financed by the World Bank and OPEC fund

Of the three recommended roads, the Lusaka – Chirundu road had the most complaints aired in the media. Safety continued to be a source of concern and being the busiest of the three roads, the Lusaka – Chirundu road was selected as a case study.

5.2.1 Rehabilitation of Lusaka – Chirundu Road

The road sector was one area that had received substantial investment from government and donors. High cost investment is a fundamental basis of selection of projects to be subjected to a technical audit (Singh, 2006). Even before completion of the works, quality and safety was a

source of concern on the Lusaka – Chirundu road project. Figure 5.2 is an example of defects and concerns raised by the public. This article was published in ‘The Post’ on 4th January, 2006 under the ‘Right to Reply’ column

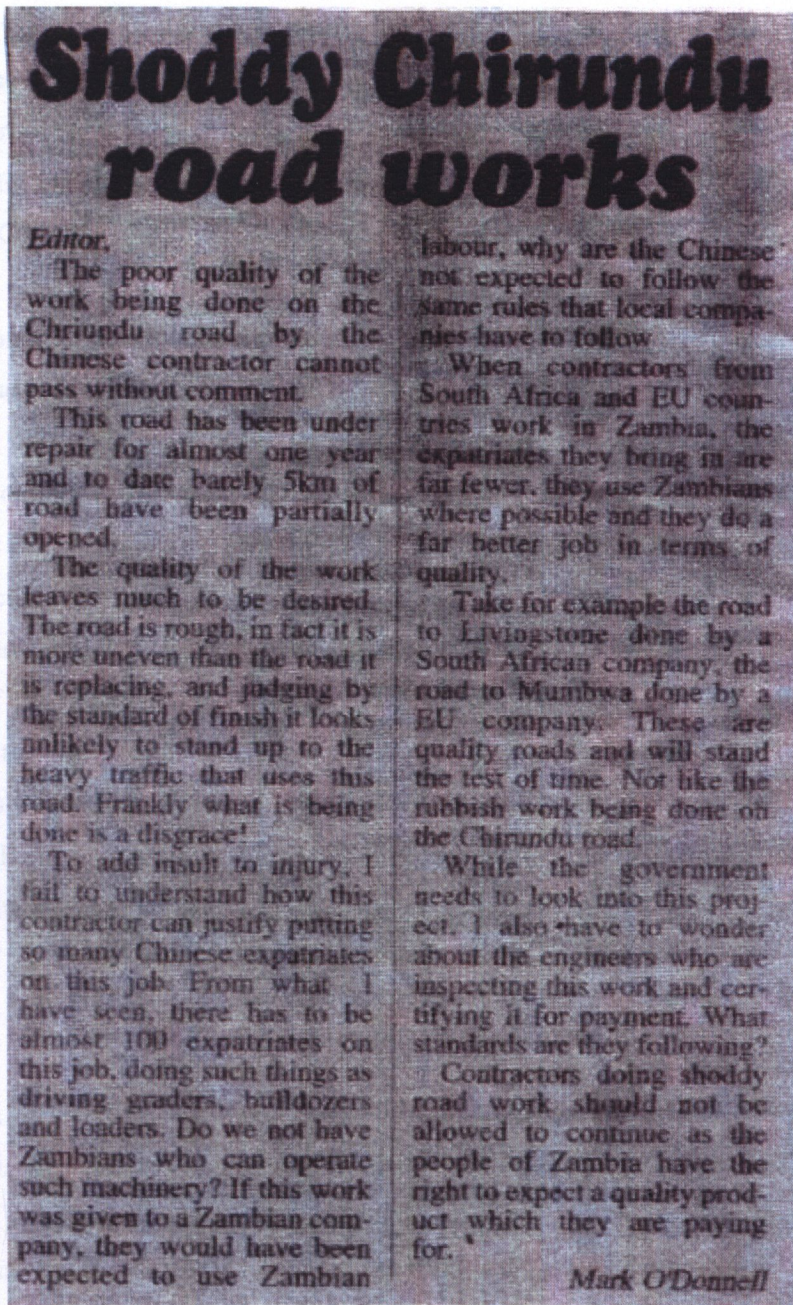


Figure 5.2: Comments on Lusaka - Chirundu Road works
(After O'Donnell, 2006)

Project particulars of the Lusaka - Chirundu road project such as contract value, scope of works, consultants and contractor details are indicated in Appendix C.1. Following a site visit, on 14 March 2008 the status of the Lusaka - Chirundu road project was that all earthworks and pavement layers had been completed. Asphalt surfacing was 98 percent complete. Culverts had been laid and works on all nine (9) bridges were done. Remaining works included completion of concrete lined and subsoil drains, gabions for erosion protection, road markings and erection of kerbs. There were additional works involving cutting of side slopes to reduce the incline which were still outstanding. Out of a contract price of K110,655,185,204.00, certified works amounted to K83,854,503,480.00, leaving a contract balance of K26,800,681,724.00

a) Pre-contract phase

The procurement of the Lusaka - Chirundu road works adhered to World Bank procurement guidelines. A 'No Objection' was sought at each stage of the procurement process. The consultancy contract appeared well structured addressing the requirements of the supervision contract. This notwithstanding, the project had some areas of concern that could give rise to unethical practices. The project did not have a risk management and mitigation plan. Formal risk assessments consist of checklists that categorize possible risk events, estimates of the probability of the risk occurring, the range of possible outcomes, the anticipated timing and frequency of the risk occurring (Cohen, 2000). The project team failed to develop definitive enhancements for opportunities and responses to project threats that could have impacted cost or schedule. Risk management should have been incorporated in the consultant's scope of works to reduce opportunities and possibilities of unethical practices in response to the occurrence of project threats.

Another area of concern was scope management. Scope change and growth is a common occurrence in construction. Mismanagement of scope change and growth can be a source of increased variations and an opportunity for unethical practices to take place. In this project, the sub-base was redesigned from 150mm to 250mm thickness due to inadequate subsurface and subsoil to sustain the impact of heavy truck traffic. In addition, the road had to be re-aligned resulting in increased earthworks and the number of trees to be uprooted. Figure 5.3 shows the re-alignment of the road. The area with parked construction equipment in the figure was the new position of the road.



Figure 5.3: Re-alignment of Lusaka – Chirundu Road

The existing road had to be re-aligned because the river embankment was being washed away. Figure 5.4 shows what remained of the retaining wall that had been constructed to provide protection to the road embankment.



Figure 5.4: Damage to embankment of Lusaka – Chirundu road

b) Post-contract phase

The post-contract stage is less complicated to audit as compared to the pre-contract stage. It concentrates more on conformance with specifications and matters of effectiveness, ensuring that the procedures set up in the pre-contract stage are running correctly. The variance between tender conditions and actual conditions could contribute to a project's susceptibility to unethical practices. The larger the project variance, the higher the risk of fraudulent opportunities.

In the case of the Lusaka-Chirundu road, the additional earthworks were quite substantial. This should be one area an independent technical auditor would need to review. A technical audit would be able to verify actual work done to quantities certified for payment. From the questionnaire survey, increases in variation claims were identified as the second most prevalent economic crime during post-contract stage. Variations would normally lead to a contract price adjustment. Due to the split in currency contribution, 10 percent local and 90 percent foreign, two adjustment formulae were applicable to the contract. A technical audit would have verified whether the calculations conformed to the contract requirements. In addition, it would have been important to have noted the source of the indices as the Central Statistics Office only lists consumer price indices. The highlighted areas of concern, if neglected, could have serious financial implications to the client. This project also had extension of time granted. Apart from design variations, other factors that were attributed to the extension of time included:

- delays in mobilisation and obtaining customs clearance for imported construction materials;
- shortages of cement on the market, resulting in the sub-base construction being stopped for one week; and
- heavy rainfall experienced during December 2007 to March 2008, that caused damage to some of the permanent works. The cost of the damage was, however, offset through insurance claims. The damage was estimated at US\$ 800,000.00.

An extension of time of 10 months was granted, increasing the original duration period by 55 percent and bringing the estimated completion date to 29th February, 2008 from 30th April, 2007. At the time of the site visit, the completion date had been further revised to 31st May, 2008. This indicated the possibility of (Singh, 2006):

- unrealistic completion period tendered for;
- poor designs; or
- weak supervision.

Design deficiencies and weak supervision during construction generally contribute to the escalation of project costs. On this project it was not easy to verify whether the design deficiencies were due to a lack of expertise, inexperience or unethical practices between the consultant and contractor. Though the quality of the road had been reported as satisfactory by Road Development Agency (RDA), visual assessment showed:

- dirty and inadequate side drains and culverts;
- poor workmanship on culvert headwalls; and
- undulations along the road.

Figure 5.5 shows poor quality plastering on a newly constructed headwall of a culvert. The plastering was already showing signs of cracking and chipping. It was observed that such works should be included in the schedule of defects and corrected before the final certificate is issued.



Figure 5.5: Newly constructed headwall along Lusaka – Chirundu Road

The undulations on the surface of certain parts of the road could have been due to the presence of a higher percentage of air voids and these could have been easily remedied by additional compacting. Some of the issues regarding quality could be attended to during the defect liability period. Once again a situation with numerous defects would indicate weak supervision and could be an opportunity for unethical practices. For instance, a contractor could request the consultant to overlook some defects because the costs involved to make good the defects would cut into the contractor's profit. The consultant would comply if compromised. On this project, a technical audit would have highlighted potential areas of defects with associated cost estimates and steps to handle the defects.

The inability to meet financial obligations on time is one of the risks that normally exist in the construction industry. It could also be an opportunity for corrupt practices such as extortion by client's personnel from contractors to ensure timely payments. This economic crime was ranked as the fourth most prevalent economic crime from the questionnaire survey. Prompt release of finances on this project indicated that the client was aware of the adverse financial implications this would have and in the process, reducing the opportunity for fraud.

In summary, it would appear that this project minimised opportunities for unethical practices by the World Bank reviewing each stage of procurement. Apart from the consultants, the National Road Fund Agency (NRFA) and RDA, the World Bank also carried out independent inspections of the works. The World Bank, as a financier had specialist engineers who monitored the project independently. The project could still have benefited from technical auditing in terms of ascertaining that the variations were necessary and that they provided a pavement with better structural capacity. In addition, the financier and client could have used the technical audit to obtain feedback on performance of the consultants and contractors for rating purposes for future contracts.

5.2.2 Presidential Housing Initiative

One of the main objectives of the research was to use a construction project that had been audited to examine and analyse the findings and recommendations. As the Presidential Housing Initiative (PHI) audit findings were made public it was easy to use this project as a case study. The background of PHI establishment and development are presented in Appendix C.2.

The audit of PHI was as a consequence of reactive auditing. The Auditor General's Office (2002) commenced the audit following reports of abuse of office and misappropriation of funds. It was reported that PHI had ignored tendering procedures in the procurement of goods and services. The initial source of the problem was how PHI was formed. It was a presidential initiative which was announced without being legislated for and any feasibility studies being prepared. When PHI was given land for construction of houses, it did not carry out a full development plan or feasibility study to provide estimates of the number of units that could be constructed and the sort of budget required. The absence of a plan and budget created weakness in the PHI system and opportunities for unethical practices. If a developmental plan and budget had been in place, they would have been the basis of PHI guideline and procedural formulation. This in turn could have acted as an internal control and minimised fraudulent opportunities.

a) Pre-contract phase

i) Fraudulent contractor qualification

PHI engaged 15 contractors to undertake various works at the Bennie Mwiinga and Twapia sites namely:

- Hua Jiang Investment;
- SineTech Construction Company;
- Phoenix Contractors;
- China Henan Corporation;
- National Housing Authority;
- Wan Kong Enterprises;
- Zamchin Construction Ltd;
- Thone Engineering;
- Gabmans Electrical Ltd;
- Able Construction;
- Fair face Enterprises;
- Indeco Estates Limited;
- Pozzolana Engineering;
- S&N Civil Builders Hardware Limited; and
- ASESCO Ltd.

Of the 15 contractors, only 5 were approved and authorised by Zambia National Tender Board (ZNTB). ZNTB did not approve the other contractors because of:

- irregularities in their procurement; and
- failure to meet minimum standards in terms of experience and capacity.

The concerns raised by ZNTB in the engagement of the remaining contractors could be interpreted as evidence of the contractors submitting fraudulent documentation to PHI before award of the works. From the questionnaire survey, this unethical practice was the most prevalent at pre-contract stage. Once again, lack of procedures and guidelines on the procurement of contractors provided a weakness in the system for fraudulent activities.

ii) Initiation of large projects

As the second most prevalent economic crime at pre-contract stage from the questionnaire findings, this activity was experienced on the PHI project. The Auditor General's (AG) report (2002) confirmed that K7 billion was applied on activities not related to PHI mandate. One project that stood out was the construction of the Institute of Democratic and Industrial Relation Studies building. This project was not budgeted for though K160,492,422 was paid in respect of designs and related consultancy fees. At the time of site inspection in July 2007, the construction works which had reached lintol level had been abandoned and referred to the courts of law. The procurement of the works that had been negotiated with only one preferred contractor was highly irregular. As the project was not budgeted for, an opportunity was available for the misapplication of PHI funds. The AG report noted that the misapplication had a negative impact on the operations of PHI.

iii) Manipulation of pre-qualification criteria

In September 2000, PHI was assigned the responsibility of refurbishing the Mulungushi International Conference Centre and Mulungushi Village complex for the 37th Organisation of African Unity (OAU) Heads of State summit. The contract was signed on 13th September 2000 between National Hotels Development Corporation (NHDC), in which the PHI chairman had shares and MKP Holdings SDN.BHD, a Malaysian company for a contract sum of US\$ 16,842,461.77. Conditions of the contract were that MKP, as contractor, was required to design, carryout and complete the construction works. NHDC, as employer, was required to

pay the contractor 50 percent of the contract sum. The contractor was required to fund the other half of the contract. Thereafter, payments would be made to the contractor on the basis of 50 percent of the value of certified works. The works included the construction of 60 presidential villas, a 300-seater convention centre and a recreation centre. On 18th November, 2000 the contract was amended. The effect of the amendment was to make MKP Holdings as the supervising organization and NHDC the contractor. Since NHDC was not physically in existence, PHI management mobilised resources to execute the work on behalf of NHDC under the supervision of MKP. The non-existence of NHDC caused numerous opportunities and possibilities of fraudulent activities in the execution of the contract. Since there was no explanation given as to what led to the amendment of the contract, it was likely caused by MKP's lack of capacity in carrying out the works. For MKP to be considered for the contract, NHDC must have manipulated the pre-qualification criteria to justify their selection. MKP's changed position as supervisor was equally fraudulent as the company was not registered with the Zambia Institute of Architects to have been able to supervise building construction works. The AG report noted that the contract sum of US\$ 16,842,461.77 agreed on 13th September 2000 was not adjusted to take into account the changed role of MKP from contractor to supervisor.

iv) Disclosure of lowest quotation

In February, 2000, a memorandum of understanding was signed between Apex Design Architects Ltd and MKP for conceptual design, amendments to working drawings, preparation of design-and-build contract in respect of the Mulungushi International Conference Centre and Millennium City. Interesting to note was that this agreement was signed nine months before the main client NHDC entered into a contract with MKP for the same works. Though it could not be proved outrightly that there was information leakage, it was observed that MKP was the preferred contractor. This observation confirmed questionnaire survey findings which ranked information leakage as a prevalent unethical practice in the Zambian construction industry.

v) Non declaration of interest

On 7th October, 2000, the PHI chairman applied to the Siavonga District Council Secretary to allocate 20 plots for PHI housing development. Later, the PHI chairman indicated that he had

found a developer, Mulungushi Millennium Development Company and suggested that the land be allocated to the proposed developer. Thirteen of the twenty plots were transferred to Mulungushi Millennium Development Company Limited. On further inquiries, it was revealed that the PHI chairman and the PHI architect were directors of Mulungushi Millennium Development Company Limited. The AG report emphasized that the diversion of PHI plots and use of PHI resources to pursue interests of a private company were irregular and fraudulent. Such unethical practices could be prevented if the procurement team had clear procedures and guidelines regarding evaluation of companies.

vi) Non disclosure of financial status

In the case of the Institute for Democratic and Industrial Relations Studies, the source of funding for the project was not known. It was suspected that the PHI chairman syphoned money from PHI to commence this project. Due to funding difficulties, the project was later abandoned as shown in Figure 5.6. This practice was unethical because the contractor's resources were tied up in the project. A technical audit at pre-contract stage would have established whether adequate funding was available and prevented an opportunity for this unethical practice from occurring. Although the questionnaire survey ranked this practice as the second least prevalent economic crime, this case study confirmed that it does occur in the Zambian construction industry.



Figure 5.6: Abandoned Institute for Democratic and Industrial Relations Studies project

vii) Collusion

There was no evidence or suggestion that contractors colluded to obtain any of the contracts at PHI. This confirmed questionnaire findings which indicated that collusion was the least prevalent economic crime in the Zambian construction industry at the pre-contract stage.

Finally, the AG report highlighted the fraudulent opportunities that surrounded the PHI project. In addition, the fact that the two officers who were initially seconded from ZNTB to PHI were withdrawn due to failure by PHI to follow procurement procedures confirmed that unethical practices took place at pre-contract stage.

b) Post-contract phase

i) Supply of inferior quality materials

Detection of this economic crime on the PHI project only became apparent when there was failure in the erected buildings. After the presidential villas, referred to in item (a) (iii) above were sold, there were complaints that the roofs were leaking. The villas initially had flat roofs but barely 5 years after construction, pitched roofs were introduced as a way of correcting the failure. The acceptable frequency for maintenance of concrete flat roofs is between 10 – 15 years. The questionnaire survey ranked the supplying of inferior quality construction materials as the most prevalent economic crime in the Zambian construction industry at post-contract stage. Therefore, the technical auditor would have to be aware of this crime to be able to prevent it.

ii) Increased variation claims

The five approved contractors referred to in item (a) (i) above were responsible for variation works amounting to K3,166,162,834 which was an additional 24 percent of the original approved contract sums. From the standard bidding documents used by the World Bank, the allowable percentage of variation was 15 percent (World Bank, 2004). The variation claims should not have been so high because all the contracts were fixed sum contracts. It was for this reason that ZNTB did not approve these variations, though PHI had already paid for them. Questionnaire survey results revealed that fraudulently increased variation claims were ranked as the second most prevalent economic crime at post-contract stage. A technical audit would have ensured that the reason, justification and authority for the variations were in order and the rates used for valuation of the variations was analysed showing detailed calculations.

iii) Extortion by client's personnel

Extortion by client's personnel is difficult to detect as it is normally concealed. However, this practice became evident when payment patterns were studied. In the case of transport hire for operations and transportation of building materials, whereas it took PHI long periods to pay five other companies, three companies namely Lwenga Car Hire, APT transport and Shankondo Investments Ltd were paid promptly. It was observed that for the three companies to have received their payments promptly, the paying authority could have been compromised. An opportunity for fraudulent activity was available because PHI did not have a payment system in place. A technical audit would have recommended the introduction of a payment register where all invoice details and the date received would have been recorded. The payment periods for different types of payments would have been known and a systematic payment schedule prepared. This internal control, incorporated in the accounts department manual would have been effective in reducing this third most prevalent economic crime at the post-contract stage as indicated in the questionnaire results. Signatures of who received the invoice and effected payment would have to be scrutinized. If the internal control procedure had been in place at PHI, it would have been easy to monitor who was responsible for the prompt payments for further investigations.

iv) False certification of works

False certification of works is sometimes a source of increased variation claims. As a prevalent economic crime, analysis and examination of re-measurement work could detect this unethical practice. Re-measurement is advisable for concealed work. Therefore it should be carried out at the time the work is done. For instance, backfilling of foundation trenches would be difficult to re-measure after the work has been covered. When contractors tender, they have an idea of quantities of items of work that were likely to reduce or increase. Contractors could therefore under price works likely to reduce and overprice those likely to increase. Thus substantial increases or reductions would not be in the best interest of the Client. It is very rare for a contractor to over price items expected to decrease and under price items with possibility of any increase. A technical auditor would be able to trace such trends and ensure controls are put in place to reduce opportunities for fraud. A technical audit of actual work done and quantities claimed for each item in the bill of quantities and in the valuation certificate would verify what quantities to recommend. The technical audit in this case would have relied heavily on site

records and documentation. Lack of comprehensive and accurate site records would be attributable to opportunities for fraudulently increased quantities of certified works. The AG office did not compare actual work done with the quantities claimed. The AG report used information from the certificates and in the absence of quantities claimed, it was difficult to have concrete evidence. The increased variations of 24 percent referred to in item (b) (ii) suggested that some quantities could have been fraudulently increased.

v) Delayed issuance of payment certificates

Though this unethical practice was reported by Transparency International (2007) as a corrupt activity, there was no evidence that this activity took place at any of the PHI activities. It was not highlighted in the AG report. The absence of this activity perhaps confirmed the questionnaire findings which ranked this economic crime as the least prevalent in the Zambian construction industry at post-contract stage.

The AG report highlighted fraudulent activities that occurred on the PHI project but lacked recommendations on how to prevent them. There was also lack of detailed technical analysis regarding quantities, drawings and specifications. It would have been these aspects that would have indicated any disparities between a technical audit and one carried out by a traditional auditor. The financial audit could therefore have been enhanced by a technical audit.

5.2.3 Rehabilitation of Mukuni Park, Livingstone

In 2005, the Government of the Republic of Zambia launched the Visit Zambia Campaign to increase awareness of Zambia as a tourist destination, specifically Livingstone which has also been known as the tourist capital of the country. Rehabilitation and enhancement of the Mukuni Park and its facilities was initiated to improve tourist facilities in Livingstone. Project particulars of the rehabilitation and enhancement of the Mukuni Park and its facilities such as contract value, scope of works, consultants and contractor details are presented in Appendix C.3. At the time of inspection of the works in February 2008, about 97 percent of the works on this project had been done. The curio sheds, Information and Heritage Centre and office block were generally complete and the project was ready for snagging.

a) Pre-contract phase

The procurement of the works adhered to World Bank procurement guidelines. A 'No Objection' was sought and granted before the award of the contract. Notwithstanding this, tender documentation did not appear comprehensive. The high provisional sums in the Bill of Quantities (BoQ) indicated a lack of detailed scope of works and drawings at planning stage. For instance, there was a provisional sum of K100,000,000.00 for external works. The description read 'Provide for demolition and reconstruction of hard surfaces externally, including roads and pathways, retaining walls and pavements' (Habiconsult, 2006). These items could have been quantified if drawings were made available. In total, provisional sums accounted for 30 percent of the contract sum which was high. The project engineer admitted that the detailed drawings were missing and that most structural and civil drawings were not available. The absence of detailed drawings and specifications provided an opportunity for fraudulent activities to occur. It was evident that the documents were not accurate and comprehensive for the scope of works to which they related. The terminology used in some of the BoQs were not standard. A technical audit at this stage would have halted the project. For effective management and prevention of fraud, the project should not have proceeded to tender until the documents were accurate, comprehensive and relevant. If halting the project was not an option, the auditor would have recommended a different method of implementation with regard to the type of contract, citing financial and logistical implications. The technical audit would have also reviewed all the existing procedures and internal controls of the client and financier and recommended necessary revisions to make them more relevant to the perceived programme of works for the project, incorporating the element of risk management. It is likely that fraudulent activities carried out at pre-contract stage would have been detected at post-contract stage. To mitigate this, stringent re-measurement of work done should have been undertaken especially for works associated with provisional sums before certification.

b) Post-contract phase

It was observed that the selected contractor did not have adequate capacity. Examination of site records revealed that resource supply on site was low and labour turnover on the project was high. The project manager admitted that the contractor required very close supervision. He acknowledged that site management was poor. The possibility that the contractor could have supplied fraudulent qualifications at pre-contract stage appeared to be high. Since the contractor

required very close supervision, a technical audit could have recommended employment of a Clerk of Works (CoW). The absence of a CoW resulted in poor contract management and further opportunities for fraudulent activities.

As expected, the variations on the project were high. Interim Certificate No. 15 indicated that the variations accounted for 20 percent of the works. The explanation given was that the quantities in the BoQs were under-estimated and many items had been omitted. Other variations which were necessitated by the client included partitioning of the curio sheds. One indication of limited scope of works at planning stage is a high percentage of variations. In this contract if the value of variations exceeded 15 percent of the contract sum then, according to clause 38.2 of the General Conditions of Contract, the changes required approval from the employer (Habiconsult, 2006). The examined documentation did not reveal whether the approval was sought and granted. Analysis of the certificates revealed that the treatment of provisional sums was incorrect. Most provisional sums were used to pay for omitted items. The provisional quantities were supposed to be re-measured before certification but this was not the case. For instance, substructure items which were provisional were not re-measured. This was an anomaly as it became complicated operationally to re-measure the works after completion. This provided opportunities for unethical practices such as fraudulently increasing quantities of certified works, increasing variation claims and concealment of defective work (Transparency International, 2007) as established by the results of the questionnaire survey. A technical audit would have deliberately verified quantities of the variation works and provisional items with the certified amounts.

Though the quality of work was rated as fair, visual assessment showed some areas of concern. For instance, doors appeared to be of poor quality. The project manager mentioned that the poor works would be included in the defects schedule to be attended to by the contractor during the defects liability period. The project manager attributed the poor workmanship to the contractor's lack of an internal quality control system because works that had to be redone were brought to the contractor's attention. Once again a situation where defects were numerous would have raised red flags during a technical audit, indicating weak supervision and an opportunity for unethical practices.

Most of the problems encountered at post-contract stage could have been adequately addressed at pre-contract stage if a technical auditor had been in place. Issues concerning the BoQs which were poorly put together and had to be redone to capture the actual works could have been addressed before commencement of construction.

At the time of going to the press, the author was reliably informed that the financier was in the process of procuring technical auditing services for this project.

5.3 Summary

In all the three case studies presented, the projects would have benefited from technical auditing. In the case of the Lusaka-Chirundu Road, the technical audit could have shown whether the variations were necessary for structural capacity and life expectancy of the road. In the PHI case, a technical audit could have contributed to the reduction in the cost of the project by preventing opportunities for fraudulent activities. In case of the rehabilitation and enhancement of the Mukuni Park, technical auditing would have reviewed all the existing procedures and internal controls of the client and financier and recommended necessary revisions to make them more relevant to the perceived programme of works for the project. Technical audits could have evaluated problems encountered on the projects and made recommendation for future projects. Finally, technical auditing could have provided the transparency and accountability lacking on these projects. This would have given a boost to the Government and cooperating partners' confidence that they were getting value for money on the projects on behalf of the people of Zambia. The three cases studies revealed opportunities of fraudulent activities in the Zambian construction industry as reported in literature and established in structured interviews and questionnaire survey.

In the next chapter, a model for technical auditing to minimise opportunities for fraudulent activities in the construction industry is presented. The model is based on the findings from the structured interviews, questionnaire surveys and case studies.

Chapter Six: Technical auditing model and its validation

6.1 Introduction

Research findings from Chapters 4 and 5 revealed that the introduction of regulatory technical auditing could be an effective measure in uncovering and preventing or minimizing unethical practices in construction. It would encourage the much needed transparency in the industry and enhance accountability. It was observed that technical auditing was not contractually recognized in any form of contract used in the Zambian construction industry. In this chapter, a best practice technical audit model is presented and incorporates standard checklists to ensure that all relevant aspects in each stage of the audit are considered. The checklists would prevent overlooking any critical aspects in construction projects thereby reducing fraudulent opportunities that may have adverse financial implications. The chapter concludes by presenting validation results of the model.

6.2 Technical audit model

The aim of the research reported in this dissertation was to develop a technical audit model to be used in the auditing of construction projects in Zambia to lower construction costs and tackle unethical practices in the industry. Research results favoured pro-active auditing through mandatory requirements as opposed to reactive auditing. Transparency International (2007) stated that there was a perception that individuals were less likely to get involved in unethical practices if there was a chance that such misdemeanours could be discovered.

From the findings, the main benefit of a technical audit was the assurance that clients were getting value for money. Other identified benefits resulting from technical audits of construction were lowering the cost of finance by eliminating corruption, identifying fraud situations which could alert financiers of projects to take appropriate action, strengthening weaknesses in project procedures, processes and administration and building industry credibility and enhancing accountability to taxpayers.

Findings from the questionnaire survey established that the pre-contract stage was more susceptible to economic crimes than the post-contract stage, making the appointment of

technical auditors at planning stage more appropriate. The appointment of the technical auditor should be made as early as possible after the appointment of the supervising consultant, preferably before the start of the tender process and the appointment of the contractor. The Environmental Protection Agency (EPA) (2000) stated that audit findings are only as good as the auditors who perform them, and the organizations that support them. Therefore, the minimum recommended requirements of the technical auditor should be at least a degree in a construction related field with extensive experience and membership of a professional body. Relationships between the technical auditor, clients, consultants and contractors should be clarified. The technical auditor should not advise or issue instructions directly to the contractor or supervising consultant without the approval of the client. Communication should be focused on seeking clarification or information regarding the project and the consultant, contractor and the client must make available documentation to the auditor when required. This relationship between the auditor and the client should be documented in the agreement with the client. In the case of the technical auditor's removal, a replacement should be made immediately.

Removal of the technical auditor from the appointment should only be considered if (Transparency International, 2007):

- all the parties agree in writing to remove the technical auditor;
- the technical auditor resigns;
- following recommendations of the professional body the technical auditor belongs to as a disciplinary action; or
- removal of the technical auditor from office by order of a court having appropriate jurisdiction.

From these findings it can be stated that a model based on a minimum of three audits during the life-cycle of an averaged sized project could bring about the best benefit in the reduction of fraudulent opportunities in the construction of a facility. The proposed model presented in Figure 6.1 is general in order that it can be adopted to suit any type of construction project.

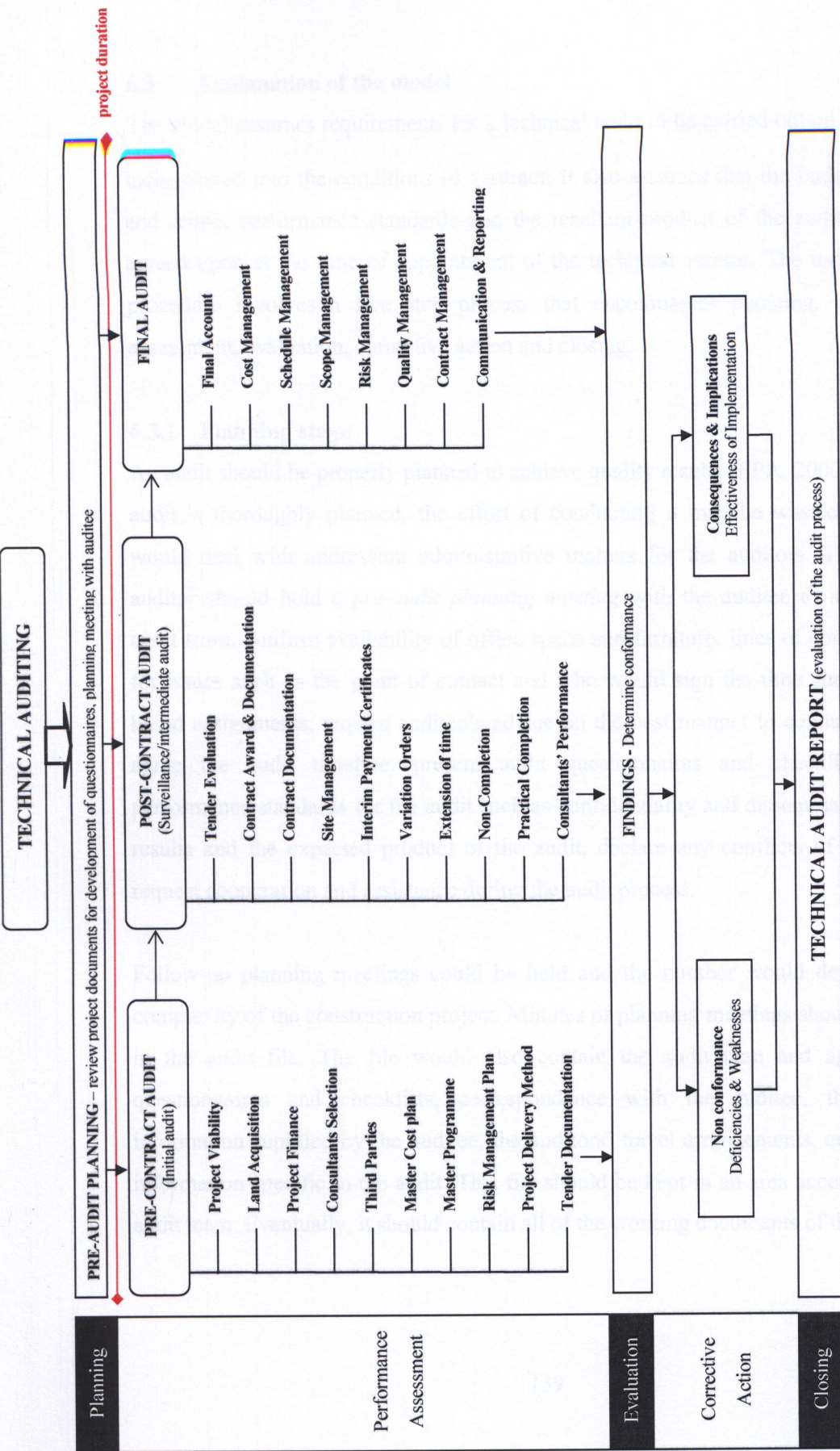


Figure 6.1: Proposed model for technical auditing of construction projects

6.3 Explanation of the model

The model assumes requirements for a technical audit to be carried out on projects are incorporated into the conditions of contract. It also assumes that the budget, purpose and scope, performance standards and the resultant product of the audit have been agreed upon at the time of appointment of the technical auditor. The technical audit procedure involves a five step process that encompasses planning, performance assessment, evaluation, corrective action and closing.

6.3.1 Planning stage

An audit should be properly planned to achieve quality results (EPA, 2000). Unless an audit is thoroughly planned, the effort of conducting it may be wasted. This stage would deal with addressing administrative matters for the auditors. The technical auditor should hold a *pre-audit planning meeting* with the auditee to introduce the audit team, confirm availability of office space and furniture, lines of communication for issues such as the point of contact and who would sign the time sheets for time based assignments, request auditee's advice on the best manner to conduct the audit, agree the audit timeline, present audit questionnaires and checklists, discuss performance standards for the audit such as confidentiality and dissemination of audit results and the expected product of the audit, declare any conflicts of interest and request cooperation and assistance during the audit process.

Follow-up planning meetings could be held and the number would depend on the complexity of the construction project. Minutes of planning meetings should be placed in the audit file. The file would also contain the audit plan and agenda, audit questionnaires and checklists, correspondence with the auditee, the pre-audit information supplied by the auditee, the auditors' travel arrangements, and any other information specific to the audit. This file should be kept in an area accessible by the audit team. Eventually, it should contain all of the working documents of the audit.

6.3.2 Performance assessment stage

At this stage of the audit process, the proposed model indicates that there would be a minimum of three types of technical audits to be carried out throughout project duration namely: pre-contract; post-contract; and the final audit. Having these audits spaced out through the duration of the project assists in building an early warning system.

During the assessment stage, the audit team carries out interviews with the auditee, site inspections, materials testing, observation of works and detailed document review. The auditee reviews checklists and answers key audit questions. It is at this stage that sufficient information should be gathered during the audit to determine whether processes met the performance criteria that were established. The audit team should not have pre-conceived notions about what it will find during the audit. The audit should be understood to be an objective evaluation of the project to help the project attain its stated goals, rather than as a means of criticizing the project or the project staff (EPA, 2000). It is the responsibility of the audit team to establish an atmosphere of trust and cooperation.

a) Pre-contract audit

The pre-contract audit could also be referred to as the *initial audit*. It should commence immediately after the technical auditor has been appointed or any time before the award of the contract. There should be enough time for the auditor to submit a report to the client in order to clarify details before works can proceed. The purpose of the audit would be to review procurement of the project management team, selected method of delivery of the project and to highlight any risk areas and deficiencies in design and tender documentation. The audit scope includes checklists of ten activities indicated under pre-contract audit in the model in Figure 6.1 and are described below.

i) Project viability

The technical auditor should go through the economic evaluation of the project especially for commercial projects. This can be achieved by considering various methods such as the net present value, equivalent uniform annual value, the benefit-cost ratio, return on investment, payback period and the internal rate of return method. It is difficult to conclude that one financing mechanism is superior to others but the investment analysis procedure should be backed by sound economic analysis for rational decision-making. Finally, the criteria for accepting or rejecting a proposal, on the basis of the objective of the investment should be clearly stated and the acceptance of the current project should be based on the established criteria.

ii) Land acquisition

The site selected should be one that will best meet the project needs. The audit of land acquisition should ensure the adequacy of land for the proposed project and that funds committed are adequate to bring the desired objectives or financial results that are comparable with returns if the funds were invested in other activities. The technical auditor should ensure that relevant authority was obtained for land purchase and that ownership documents such as title deeds are in order. Verification regarding caveats, cost of vacant possession if the site is occupied by illegal squatters or cost of land rehabilitation if the land was used for dumping should be undertaken. Finally, the auditor should confirm that the property is recorded in the client's asset register if it is for own use.

iii) Project finance

The technical auditor should consider the source of financing and ensure that the terms and conditions of the financing are adequate for the project. Confirmation regarding adequate funding for project owners' administration should be done because most financiers prefer to finance project direct costs such as land purchase, professional fees and actual construction. The auditor should confirm that sources of funds are

acceptable. Bank overdraft facilities should not be considered as a source of long-term funding.

iv) Third parties

There are a number of matters that need to be referred to third parties such as Environmental Impact Assessment (EIA). Matters which may involve third parties include adjoining infrastructure, boundaries, environmentally protected areas, mineral discoveries, advertising, multi-facility zones, statutory approvals and licensing laws. For all third party matters whose services have to be outsourced, the technical auditor should ensure that the appointment of third party consultants is adequate to bring the desired objectives in line with statutory requirements and ensure that the budget for third party processes is not exceeded.

v) Selection of consultants

The technical auditor has to ensure that the appointed consultants possess the skills that are necessary to meet the needs of the project. Signed contracts for each consultant should be available and the technical auditor should verify that the contracts include the mandatory clauses such as the main responsibilities of the parties, duration of the contract, quality of service, payment terms, compensation events, rights to materials, indemnity, insurance and liability conditions and rules of termination (ICE, 2005).

vi) Master cost plan

The master cost plan provides the best possible estimate of the final cost of the project. Much of the information in the plan is developed by the project team. The technical auditor should verify computation of the estimate and ensure it includes all cost elements such as consultants' fees, forecast of construction tender price, development costs, contingencies, direct purchases and inflation allowance. When an alteration to the design or scope is made, the technical auditor should ensure that the master cost plan is reviewed systematically and reconciliations made of deviations between forecasted budgets and actual costs.

vii) Master programme

Master schedules for design and construction should be reviewed to ensure schedule estimates involve the definition, sequencing and duration estimation of individual project activities. The technical auditor should ensure that the proposed programme of works meets the requirements of the project and is realistic and achievable. The project team should utilize the schedule to manage the project as a process for mitigating delay in the event that the schedule shows the project is behind and should ensure that schedule revisions are documented.

viii) Risk management plan

The technical auditor should consider what risk management procedures have been put in place by the project management team. The failure to take a pro-active approach to allocation of risks throughout the project may be detrimental to the project. Each project should have its own specific risk profile with a *mitigation plan*, detailing opportunities and responses to project threats that might impact cost or schedule (Cohen, 2000). The project risk profile can be used in the selection of the most appropriate project delivery method.

ix) Project delivery method

The recommended method of delivery of the project should be reviewed. The appropriate project delivery method is one that best suits the overall project requirements. The selection of the most appropriate project delivery method depends on the risk profile for the particular project which is intended to be put to the market for tendering. For projects with low risk profile scores, the appropriate delivery method would be the traditional contract with fixed lump sum or Bill of Quantities, whereas financed contracts such as the Private Public Partnership (PPP) would be suitable for projects with high risk profile scores. For medium risk profile scores, design and build, cost plus or patch contracts would be suitable.

x) Tender documentation

For prevention of fraud, the technical auditor should ensure that all tender documentation is relevant, accurate, comprehensive and timely. The technical auditor should review the bid invitation procedure to ensure that a competitive tender field was established. The content of the tender dossiers will vary but the following key documents will generally be required as a minimum: Instruction to Bidders; Conditions of Tendering; Form of Tender; Conditions of Contract; Specifications; Schedules or Bills of Quantities; Drawings and samples of forms for bid security, performance bond guarantees, advance payment guarantees and retention.

b) Post-contract audit

The post contract audit also has checklists of ten activities that would need to be verified. This audit would commence when the project is approximately 25 percent complete in terms of contract duration. At this stage substantial work would have been done for the technical auditor to review procedures put in place. The purpose of the audit is to review management of the project, construction methodologies, determine conformance to contract provisions, document any non-conformance and to establish the expected and achieved objectives in terms of estimated costs, duration, quality and technical objectives. On large projects it may be necessary to carry out more than one post contract audit. Such audits also known as *surveillance or intermediate audits* should be specified in terms of reference for appointment of the technical auditor. It is advisable that the intermediate audit be carried out at a time approximately halfway through the project but not more than six months after completion of the initial audit.

i) Tender evaluation

Verification that bids were analysed against the criteria for selection defined in the tender documents should be undertaken. The tender should be verified in terms of contract price after corrections, construction period, innovation of the bidder with regards to work execution methods and conformity to bid requirements. The capability of the contractor should be evaluated in relation to previous experience on

similar works, financial resources, managerial and personnel resources, technical resources, current workload, dispute resolution records, quality assurance systems, environmental compliance records, industrial relations records and occupational, health and safety, and rehabilitation records

ii) Contract award and documentation

The technical auditor should review the bid evaluation report which summarises the methodology undertaken and final recommendations, stating the reasons for selection. Treatment of unsuccessful bidders such as whether a debriefing meeting was held should be considered. The technical auditor should ensure that all the terms and conditions of the contract are clear, effective and relevant to the scope of works. An opportunity for fraudulent practices may arise from misinterpretations of prescribed terms and conditions. Negotiation documents that formed the basis of the award of the contract should be included in the contract package. Finally, the technical auditor should ensure that original contract documents are stamped and kept in safe custody.

iii) Project commencement

Verification regarding contractor mobilisation with contract commencement and site possession dates clearly stated should be done. The auditor should verify that the necessary bonds, warranties, insurance policies and power of attorney submitted are in order.

iv) Site management

The contractor has a responsibility for maintaining a safe site during construction. In evaluating the contractor's site management capability, the technical auditor should consider the general conditions of the construction site, its orderliness and verify resources stated in bid documents against those on site. Services provided on site should be adequate and as provided for in the contract. Site safety and incidences of accidents, thefts, damages, malicious or otherwise should be emphasized. Site management evaluation will vary depending on project type and location.

v) Interim payment certificates

The technical auditor needs to ensure that payment should be for the value of the work done based on the rates in the contract bills. Calculations and adjustments should be verified in terms of re-measured work, variations, costs for extension of time granted with costs, retention, price adjustment percentage, cost fluctuations, materials on and off site included as part of the works, advance recovery, any liquidated and ascertained damages charged and value added tax.

vi) Variation orders

A variation can be described as any alteration or modification of the design, quality, quantities of the works as shown in the contract drawings and specifications (Singh, 2005). Variations can cause the cost of contract to either increase or decrease. The technical auditor needs to verify and check all variation works in terms of reason, justification, authority and value. The technical auditor should monitor any variation orders with substantial decrease in quantities and value. There may be possibilities that consultants may not strive for the highest value reduction of any variation orders that may have a substantial decrease in the final cost of the contract as it may adversely affect their quantum of professional fees (Singh, 2006).

vii) Extension of time

Extension of time applications are made when there is anticipated delay. To prevent opportunities for fraudulent practices, the technical auditor should verify the reason and relevant clause authorizing the extension. The extension of time may be granted with or without costs. It is important to ensure that performance bond and insurance policies are correspondingly extended where extension of time is granted. If the extension is not granted, the contractor could invoke the disputes clause.

viii) Non-completion of works

If the contractor fails to complete the works by the contract completion date, a summary of incomplete works together with the certificate of non-completion should

be issued. The technical auditor should ensure that the correct liquidated and ascertained damages as per contract are charged. Finally, the technical auditor should ensure that relevant copies of correspondence regarding the contractor's poor and unsatisfactory performance, together with signed certificates of non-completion, are forwarded to the relevant bank and insurance company for execution of performance bond. Advice and assistance of a legal professional may be utilised to avoid any procedural errors.

ix) Practical completion

The technical auditor should ensure that the works are completed according to the scope of works with minimal defects. The auditor should check the schedule of defects and ensure that the contractor rectifies the defects entirely at contractor's cost. Apart from verifying items included on the practical completion certificate, the technical auditor should ensure that ownership of capital assets procured under contract such as vehicles, survey instruments and office equipment are settled and that the client should receive indexed working manuals, as-built drawings and certificate of occupancy from the relevant authorities.

x) Consultants' performance

At this stage, the technical auditor should review consultants' pro-activity, control and approval procedures on the project. Assessment of the consultants' performance in terms of adequacy of materials tests recommended, qualifications of consultants' staff, site communication and reporting procedures, knowledge of the contract, quality of work completed, consultants' progress reports, and general attitude of the consultant towards the project should be performed.

c) Final audit

The final audit should be carried out at practical completion stage before issuance of the final certificate. This audit should review the entire contract to determine conformance of all aspects. Problems encountered on the project should be evaluated

and used to propose solutions for future projects. The audit can be used to obtain feedback on performance of the consultants and contractors for rating purposes for future contracts. The degree and complexity of this audit would depend on the results from the previous audits.

i) Final account

The final account has financial implications that may include additional costs and other aspects that are susceptible to fraudulent practices. The technical auditor should verify that all entries are correctly accounted and any bonds, guarantees and warranties are accordingly released. The prompt finalization and issue of a statement of final account is also a sign of efficient financial management of any construction contract as delays may create opportunities for fraud and financial claims from either party.

ii) Cost management

The risk of cost overruns is common on construction projects. The technical auditor should evaluate the project team's ability to manage the project's budget, checking what control processes were in place to reconcile deviations. Emphasis should be placed on detecting typical overcharges in contract sums and identifying common problems that might occur in consultants' fee charges.

iii) Schedule management

Schedule management is what the project team has done to ensure timely completion of the work. The technical auditor should evaluate the processes for reviewing and comparing planned to actual project progress and steps taken to mitigate delay through examination of schedule revisions depicting the contractor's recovery plan.

iv) Scope management

Changes in scope and scope growth are a common occurrence in construction. If not managed properly, changes in scope can pose a risk to timely completion and adherence to project budget. The technical auditor should review the project team's

process for managing and controlling project scope. Verification and assessment as to whether the scope changes were beneficial and necessary should be carried out.

v) Risk management

Risk management is a continuous process that begins at project inception and should be performed on a regular basis throughout the project. The technical auditor should review steps taken by the project team to respond to project threats that might impact cost or schedule.

vi) Quality management

Quality management includes the processes required to ensure that the project meets the needs for which it is undertaken. For quality assurance, the technical auditor should review the planned and systematic activities the project team had implemented to ensure that the project satisfied the relevant quality standards. For quality control, specific material test results and workmanship should be checked to determine if they comply with contract specifications.

vii) Contract management

Here, the intention is to ensure that the project is managed in a consistent manner and in accordance with proven industry practices. Contract management is the process of managing the contractual relationships between the parties, ensuring consultants and contractors meet contract requirements. The technical auditor should review progress payment processes, contract variation processes, compliance with contract provision, performance reporting and timely completion.

viii) Communication and reporting

It is essential that an accurate record of the project is maintained from the onset of the project until its completion. The technical auditor should review standard project correspondence and reports such as monthly progress reports, site minutes, performance reports, schedule and budget reports including revisions or variance

analysis. In the event that legal action, liens or claims are filed against the client, the written record should be able to provide a historical account of the project.

6.3.3 Evaluation stage

This phase may be the most critical for the success of the audit. It is important to be objective when identifying findings. Audit findings can be positive practices or conditions, neutral observations or non-conformances (EPA, 2000). The relevance of the findings is important. A finding may not be significant if there are no implications. At this stage a draft audit findings report should be prepared. This report should give enough detail about the audit to enable readers to understand the current status of the project and to estimate whether project objectives will be met. The report should have an introduction and summary of findings, their basis and those requiring corrective action.

6.3.4 Corrective action stage

The prime purpose of any technical audit is to compare and contrast the conditions found during the technical audit with those expected to be found prior to carrying out the audit (Public Works Directives, 2002). During actual auditing, this purpose must be consistently borne in mind by the technical auditor. After an audit, necessary corrective action should be timely and effective. Effective implementation of corrective action should be completed to avoid recurrence and maintain confidence in the audit system.

a) Non conformance

Where the conditions found during the audit do not correspond to those anticipated, preparation of a non-conformance report should be considered by the technical auditor. Non conformances are deviations from standards and documented practices. These can be classified as deficiencies which adversely impact the project works, or weaknesses which result in unacceptable practices (EPA, 2000). It is also important to consider how widespread the non-conformances are and their root causes such as insufficient resources or inadequate funding. A remedial action schedule should be prepared

indicating measures to correct each non-conformance, assignment of the responsible party to effect the action and completion dates for each corrective action. The technical auditor should identify all root causes of significant deficiencies and indicate steps to prevent the recurrence of similar deficiencies.

b) Consequences & Implications

The technical auditor should make an overall assessment of how well the project has achieved its objectives. Contractual implications where the conclusion is that either the consultant or the contractor has been in breach of their respective contracts and that this will lead to under performance of the final product, then the contracts specific terms and clauses should be highlighted for the client to take appropriate action. In addition, design, material and construction compliances will be evaluated. The consequences of construction tolerances or material specifications not being met can be severe such as a poorly constructed road would require premature maintenance, rehabilitation or strengthening. An assessment of the remaining structural capacity of the road and comparison with the design traffic will help the auditor decide on the best remedial action. Updating of costs, technical, environmental and social objectives such as estimated annual maintenance costs using present day labour and equipment costs and economic and financial internal rates of return based on actual capital costs will also be undertaken.

6.3.5 Closing stage

Closing of an audit is the last formal action of the audit process. It occurs after all corrective actions have been implemented and confirmed as effective. Following the auditee's response to the draft findings report, the final report is prepared. The technical audit report should summarise the state of the project audited as briefly and effectively as possible, including assessments of cost-effectiveness or efficiency, non-conformance reports and summary conclusions, with recommendations.

The auditor should also prepare a performance evaluation report of the audit process. The report documents whether the audit itself was within budget, achieved its objectives, identified any fraud situations, provided confidence in economic viability of the project, provided financial recoveries, contained any weaknesses in its policies, guidelines and procedures and whether it provided value for money. Finally, the rating of the consultants' and contractors' evaluated performance is indicated for recommendation for any future projects.

After development of the model, validation was undertaken to verify its acceptance and appropriateness to the Zambian construction industry.

6.4 Validation of the model

The concept of validation is an accepted form of critique (Muya, 1999). The technical audit model was validated by assessing its functionality, usability and usefulness. This was achieved by sending a validation questionnaire to ten managers in the five sectors of the construction industry. The validation questionnaire with its' accompanying cover letter are in Appendices D.2 and D.1 respectively. The responses of the ten respondents are presented below.

6.4.1 Respondents profile

Figure 6.2 shows percentage breakdown of respondents by sector. Two respondents were targeted for each of the sectors except the supplier sector to obtain a uniform representation of the Zambian construction industry. The list of participants used in the validation of the technical auditing model is presented in Appendix D.3. Seven (7) respondents were from senior management and three (3) were from middle management with experience in the construction industry ranging from 12 – 24 years.

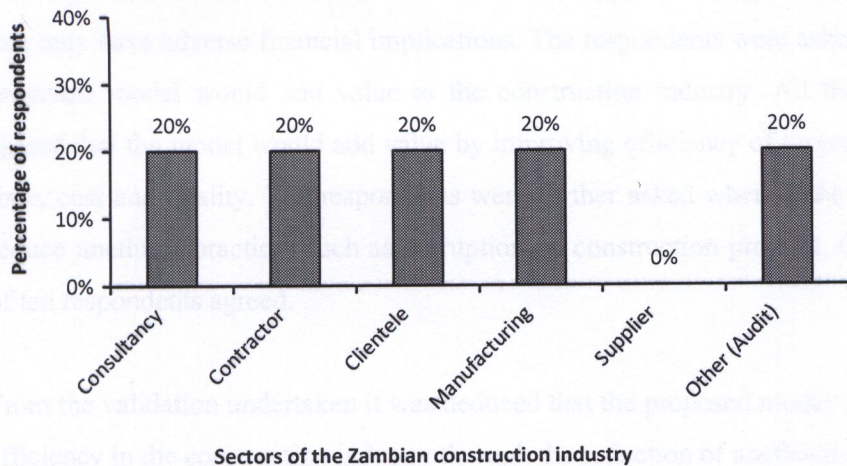


Figure 6.2: Breakdown by type of respondents' sector representation

6.4.2 Functionality

Functionality is the degree to which the model is generic such that it is appropriate for different project sizes, complexity and delivery method. The respondents were asked whether the proposed model could easily be adopted for various construction projects. Apart from one respondent who was not sure, the remaining respondents felt that the model was adaptable.

6.4.3 Usability

Usability focused on the degree to which users were able to use the model without assistance from consultants. Construction terminology had to be maintained as the technical auditing model was developed for personnel with a construction background. The respondents were asked whether the steps of the proposed model were simple to follow and implement. Once again, apart from one respondent who was not sure, the remaining respondents agreed that the model was easy to use and implement.

6.4.4 Usefulness

For the model to be used it has to provide value to the user. Therefore, usefulness was assessed in terms of the respondents' perception of whether they found that it

prevented or minimized fraudulent situations and opportunities for unethical practices that may have adverse financial implications. The respondents were asked whether the proposed model would add value to the construction industry. All the respondents agreed that the model would add value by improving efficiency of projects in terms of time, cost and quality. The respondents were further asked whether the model would reduce unethical practices such as corruption on construction projects. Only eight out of ten respondents agreed.

From the validation undertaken it was deduced that the proposed model could improve efficiency in the construction industry through the reduction of unethical practices such as corruption.

6.4.5 Suggestions

The respondents were asked to make any suggestions or improvements to the model. The majority of the respondents felt that there was need to enforce the requirement of technical auditing in contractual documents and agreements. Respondents expressed concern about financial implication of technical auditing.

6.5 Summary

In this chapter, a technical audit model was developed as a best practice model. The model was validated by ten managers from the five sectors of the construction industry. The technical audit model incorporated standard checklists which ensured that all relevant aspects in each stage of construction were taken care of to avoid overlooking any critical aspects. Though it was difficult to readily identify the weaknesses that may give rise to fraud, the checklists could assist in taking appropriate remedial measures at the earliest time, thereby prevent if not minimize fraudulent situations and opportunities that may have adverse financial implications. Though implementation of the model could lower construction costs and tackle unethical practices in the Zambian construction industry, checklists would vary for particular projects according to factors such as project size, complexity and delivery method.

Nevertheless, the model was perceived as user friendly. The next chapter presents conclusions of the research taking into account research findings from interviews, questionnaire surveys, case studies and the proposed technical auditing model.

Chapter Seven: Conclusions and recommendations

7.1 Introduction

In the previous chapter, a technical audit model was developed and validated by construction industry professionals. This chapter presents the conclusions drawn from the analysis of results from the questionnaire survey, structured interviews, case studies and the model validation exercise. In addition, it presents recommendations directed at reducing economic crimes in the Zambian construction industry and elsewhere in the world. It further highlights limitations regarding the study and opportunities for further research.

The aim of the research was to develop a technical audit model to be used in the auditing of construction projects in Zambia tackle unethical practices in the industry. This was achieved by developing a best practice model incorporating standard checklists to ensure that all relevant aspects of a project in each stage of the audit were considered. The checklists would prevent overlooking any critical aspect in construction thereby reducing fraudulent opportunities that may have adverse financial implications.

7.2 Prevalence of unethical practices in Zambian construction industry

This study established that corrupt practices were prevalent in the Zambian construction industry, with the pre-contract stage being more susceptible to fraudulent opportunities than the post-contract stage.

7.3 Existing regulations and punitive measures

Stakeholders exhibited little faith in the capability of traditional audit institutions such as the Auditor Generals' Office and traditional financial audit firms in carrying out

technical audits, exposing and preventing unethical practices in the Zambian construction industry.

7.4 Benefits of technical auditing

It was concluded from literature review and the questionnaire survey that the main benefit of technical auditing to clients was the assurance that they were getting value for money. In addition, technical audits would assist in identifying fraud situations which could alert financiers of projects to take appropriate action. It was also resolved that technical auditing could be used as a tool for rating and obtaining feedback on the performance of consultants and contractors. Finally, with transparency and accountability for public resources at very low levels in the Zambian construction industry, technical auditing was viewed as one of the solutions to bringing back integrity into the industry.

7.5 Technical audit model

A pro-active technical audit model was developed as there was a perception that individuals were less likely to get involved in unethical practices if there was a chance that such misdemeanours could be discovered. Thus the appointment of a technical auditor and audit commencement at the planning stage of a construction project were seen as necessary to take into account unethical practices at the pre-contract stage.

7.6 General recommendations

Arising from the above conclusions, the following are the main recommendations directed at preventing or minimising unethical practices in the Zambian construction industry and elsewhere:

- promotion, introduction of regulatory technical auditing and appointment of independent technical auditors at pre-contract stages of projects should be made a requirement. There is need to revise standard forms of contract to include technical auditing on construction projects;

- construction industry regulatory bodies, such as the National Council for Construction (NCC) in Zambia, should like the World Bank, should ensure that non-conforming firms are punished through blacklisting or deregistration;
- the construction industry in Zambia, and elsewhere in the world, where this does not exist, should consider the introduction of a whistle blowing system which is secure and easily accessible for anonymous reporting through dedicated hotlines for construction related unethical practices. The system should be centred on protecting and rewarding whistle blowers as everyone has a legal and ethical duty to blow the whistle on an erring colleague, employer or client (Agapiou, 2008);
- to enhance capacity, construction auditing units should be established in national auditing authorities, such as the Auditor General's office in Zambia which is currently mandated to audit all public accounts, to ensure that public funds are properly received, expended and accounted for;
- national authorities responsible for regulating and controlling public works procurements, such as the Zambia Public Procurement Authority (ZPPA) formerly the Zambia National Tender Board (ZNTB) in Zambia, should ensure that only fully funded public projects citing the source of funding are procured. Approval documentation from relevant authorities such as responsible ministries or boards of directors should accompany such tender documentation;
- professional bodies should adopt anti-corruption policies such as the one proposed by the UK Anti-Corruption Forum for the Infrastructure, Construction and Engineering (IC&E) sector whose objective is to establish effective rules and procedures to reduce the incidence of corruption involving members and to deal effectively with incidences that arise (UK Anti-Corruption Forum, 2008);
- the construction industry should adopt the Project Anti-Corruption System (PACS) developed by Transparency International. Integrity PACS are contracts between government offices and contractors for particular projects. They prohibit bribery, ensure transparency in the bidding process and enforce sanctions in case of violations; and

- The construction industry through professional and regulatory bodies, such as the NCC in Zambia, should raise awareness of unethical activities, and outline disciplinary and criminal sanctions especially in cases where individuals could be unknowing participants in corrupt activities.

7.7 Limitations of the study

The study, though, had some limitations that need to be taken into consideration when interpreting the reported findings. A major limitation of the study was the scarcity of literature on technical auditing in Zambia and the large geographical coverage of the country, which was the study area. Initially, it was planned to distribute the questionnaires via email to respondents in provinces. However, lack of internet connectivity and low usage by respondents became a limiting factor to the expansion of the sample population. Also, though the questionnaire was distributed to all sectors of the construction industry, none were received from suppliers to ascertain issues of quality of materials delivered to projects. Furthermore, the absence of an internationally accepted definition of economic crime can be cited as weakness in the study. Economic crime was interchanged with corruption, which also lacks an international definition (Transparency International, 2007). Varying interpretations by respondents could have had an influence on the results reported in the paper. Though, as a research instrument, the questionnaire assured anonymity, it was difficult to confirm that the respondents were candid about unethical practices in construction an issue that is considered sensitive. Often, individuals could be unknowing participants in corrupt activities. Therefore, different understanding and interpretations by respondents could have also had some distortions on the reported results. Finally, although the study highlighted the possible working parameters of technical auditing in the construction industry in countries like Zambia, the economic conditions are different for different countries, the level and sophistication of unethical practices in construction projects are probably be different. The findings of this research are therefore limited to Zambia and other countries with similar economic conditions.

7.8 Recommendations for future research

The study gives insights into levels of unethical practices in the construction industry. More detailed studies are recommended in order to develop deeper insights into the nature of the remaining unethical practices and how they can be better tackled.

7.9 Summary

The prevalence of economic crimes in Zambia, if unchecked, could stifle the growth of the construction industry, and consequently the national economy. It could further perpetuate the survival of inefficient and corrupt construction companies. Introduction of regulatory technical auditing, by requiring the appointment of technical auditors and audit entry at planning stage of projects, could be an effective measure in uncovering and preventing or minimizing unethical practices in construction. Accountability would also be enhanced if perpetrators of economic crimes were punished through blacklisting, de-registration and prosecution. Increased client confidence could ensure improved investment in the industry and ultimately lead to increased construction activity in the country. The model developed could prove useful in Zambia and other countries with similar economic conditions and elsewhere in the world. If adopted, mandatory technical auditing holds the potential to reduce incidences of unethical practices in the construction industry.

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APPENDICES

Appendix A: Questionnaire survey

A.1 Companies utilized in questionnaire pre-test

S/No.	Company Name	Company Activity
1.	Hertman Ent. Ltd	Construction Company
2.	Trio Consult	Architectural firm
3.	Grant Thornton	Auditing firm

A.2 Basis of population sample selection for questionnaire survey

S/No.	Organisation	Quantity
	Association of Consulting Engineers of Zambia (ACEZ)	
1	DH Engineering Consultant	1
2	RM Consulting Engineers	1
3	Zulu Burrow	1
4	BCHOD	1
	Quantity Surveyors	
5	Surveyors Institute of Zambia - QS Chapter	2
6	HB Chalwa Associates (Chartered QS)	2
7	Adam Hood & Partners	1
8	Seld Integrated Solutions	1
	Architectural Firms	
9	MP Consulting	1
10	Trio Consult	1
11	Mutema Associates	1
12	Zambia Institute of Architects (ZIA) - Secretary	1
	Association of small scale contractors	
13	Chusaka Construction Limited	1
14	Eldon Zambia Limited	1
15	Hertman Enterprise Limited	1
	Association of Building and Civil Engineering Contractors	
16	Turner Construction	1
17	China Jiangxi	1
	Auditors	
18	Grant Thornton	2
19	Zambia Institute of Chartered Accountants (ZCAS)	2
20	Auditor General's Office	2
	Manufacturer	
21	LaFarge (Z) Ltd	1
22	Oriental Quarries	1
23	Kafue Steel	1
24	Amalgamated Steel	1

S/No.	Organisation	Quantity
	Supplier	
25	Micmar	1
26	Lusaka Ceramics	1
27	Plascon paints	1
28	Zesco	1
	Clientele	
29	National Road Fund Agency	1
30	Road Development Agency	1
31	Ministry of Works and Supply	1
32	Ministry of Finance and National Planning	1
33	Buildings Department	1
34	Zambia State Insurance Corporation	2
35	National Housing Authority	2
36	National Housing Bonds Trust	2
37	ZEPEIU	1
38	Chipata Municipal Council	1
39	BP (Z) Limited	1
40	Lusaka City Council	1
41	Kitwe City Council	1
42	Solwezi Municipal Council	1
43	Institutions	
44	Copperbelt University	2
45	University of Zambia	2
46	National Council for Construction	1
	Donor Agencies	
47	World Bank	1
48	UNDP	1
49	EU	1
50	Africa Development Bank	1
51	JICA	1
	Total	60

A.3 Questionnaire survey cover letter



School of Engineering
Department of Civil & Environmental Engineering,
University of Zambia, Lusaka

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.....
.....

Dear Sir/Madam,

Questionnaire Survey – The need for regulatory technical auditing of construction projects in Zambia

Unethical practices such as bid rigging have grown at a phenomenal rate worldwide with most sectors of the economy realising that financial auditing by itself is not capable of tackling these sophisticated crimes giving rise to Technical Auditing. In construction, Technical Auditing is an independent formal assessment of the extent to which a project has followed the procedures laid down in the contract documentation from feasibility study to physical completion of the constructed facility.

This questionnaire generally seeks both qualitative and quantitative information about your views on the Zambian Construction Industry and in particular whether mandatory technical auditing is the answer to reducing unethical practices.

I would greatly appreciate you taking the time to provide this information. Where necessary, it would be appreciated that this questionnaire be redirected to the appropriate groups within your organisation involved with the “procurement of construction works”. If there are no such groups within your organisation, we would appreciate a response on behalf of your organisation as a whole.

Your responses will be held confidential.

Thank you for taking the time to read this information. It would be appreciated if the completed questionnaires could be returned by early February at the latest.

Please return the completed questionnaire to:

Balimu Mwiya Sichombo
MEng Research Student
P.O Box 50471
Lusaka
Mobile:0955 837400

A.4 Questionnaire

AN INVESTIGATION INTO THE NEED FOR *TECHNICAL AUDITING* IN THE ZAMBIAN CONSTRUCTION INDUSTRY

For the construction industry, a technical audit is an independent formal assessment of the extent to which a project has followed the procedures laid down in the contract documentation from feasibility study to physical completion of the constructed facility.

A. GENERAL INFORMATION

1. Name of employer / business
2. What is your current position in your organisation (*please tick*)?
Junior management Middle management Senior management
3. Which construction sector do you belong (*please tick*)?
Clientele Consultancy Manufacturing Supply Contractor Other (*State*).....
4. What is your highest level of education (*please tick*)?
Form V /Grade 12 Diploma Bachelors Degree Masters Degree Doctorate
5. How many years of experience do you have in the construction industry (*please tick*)?
None Less than 5 years Between 5 – 10 years more than 10 years
6. Do you have any knowledge in technical auditing (*please tick*)?
Yes No
7. If you have any knowledge in technical auditing how did you acquire it? Through
Formal training On job training Not applicable

B. PERCEPTION OF THE ZAMBIAN CONSTRUCTION INDUSTRY

8. Corruption has taken centre stage today. Which sector of the Zambian construction industry do you think is rife with corruption and fraud (*tick any or all applicable*) ?
Clientele Consultancy Manufacturing Supply Contractor

9. Economic crimes such as fraud, extortion, collusion, corruption can be carried out by an individual or a corporate entity. Who do you think is responsible for majority of the economic crimes in the construction industry (*please tick*)?

Corporate Entities Individuals Both Not sure

10. Economic crimes occur at various stages in the construction process? Rate the prevalence of each economic crime accordingly (*please tick*).

a) Planning up to tender stage

	Very Common	Common	Don't Know	Rare	Very Rare
Collusion where contractors tender at a higher price so as to ensure that the pre-selected contractor wins the tender.					
Manipulation of pre-qualification by consultant where the contractor who bribed the consultant wins the project.					
Extra quotations for price comparison only where the lowest price is disclosed to the favoured contractor who quotes lower and is awarded the contract.					
Non disclosure of interest in favoured companies by consultant /owner which win the contract or sub-contract					
Non disclosure of financial status of the owner to the contractor at the time of placing the tender because the contractor was unlikely to commence work if he was aware of the project owner's financial difficulties.					
Fraudulent qualifications where the contractor makes false claims on his equipment, his employees and the company's qualifications.					
Initiation of a large complex project by a government official where the favoured contractor adds a percentage to the contract sum for the official					

b) Contract Execution

	Very Common	Common	Don't Know	Rare	Very Rare
Supplying inferior cheap material where consultant certifies but contractor is paid in full for quality material.					
False certification of work by the Quantity surveyor where the quantities are falsely increased and money shared between QS and contractor.					
Increased variation claim where the quantities are exaggerated and once paid shared with consultant.					
Delayed payment where owner bribes architect to delay issuance of a payment certificate.					
Extortion by project owner's accountant where the accountant request a payment to pass the contractor's certificate.					

11. Would you advocate for the blacklisting of contractors as a solution to curtailing economic crimes (*please tick*)?

Yes No

12. Would you advocate for de-registration of consultants as a solution to curtailing economic crimes (please tick)?

Yes No

C. CONSTRUCTION WORKS OVERVIEW

13. As a stake holder how many construction projects have you been involved in the last five years (please tick)?

None 1- 5 5 – 10 more than 10 projects

14. Of the projects in 13 above what percentage was completed within schedule (please tick)?

0% less than 50% more than 50% 100%

15. Of the projects in 13 above what percentage was completed within budget (please tick)?

0% less than 50% more than 50% 100%

16. Of the projects in 13 above what percentage was of acceptable quality (please tick)?

0% less than 50% more than 50% 100%

17. Of the projects in 13 above what percentage remains incomplete (please tick)?

0% less than 50% more than 50% 100%

18. Of the projects in 13 above what percentage was completed only after change of contractors (please tick)?

0% less than 50% more than 50% 100%

19. Of the projects in 13 above what percentage had disputes or legal consequences (please tick)?

0% less than 50% more than 50% 100%

20. Of the projects that had disputes or legal consequences , were these disputes resolved by arbitration (please tick)?

Yes No Not applicable

21. All dispute resolution result in monetary compensation (please tick)?

Strongly Agree Agree Not Sure Disagree Strongly Disagree

D. TECHNICAL AUDITING

22. Has a technical audit been carried out on any of the projects you have been involved in (*please tick*)?

Yes No

23. What category of consultant carried out the technical audit.

Architect Engineer Quantity Surveyor Accounting auditor Other (*State*).....

24. Technical Auditing will boost the confidence of project owners knowing that they are getting value for money on their construction projects (*please tick*)?

Strongly Agree Agree Not Sure Disagree Strongly Disagree

25. Technical auditing will contribute to lowering the cost of project finance by eliminating corruption, fraud (economic crimes) (*please tick*)?

Strongly Agree Agree Not Sure Disagree Strongly Disagree

26. Technical audits will enhance accountability (*please tick*)?

Strongly Agree Agree Not Sure Disagree Strongly Disagree

27. Availability of information through a technical audit will reduce the period of dispute resolution (arbitration) (*please tick*)?

Strongly Agree Agree Not Sure Disagree Strongly Disagree

28. The Auditor General’s Office has capacity to carry out technical audits on construction projects (*please tick*)?

Strongly Agree Agree Not Sure Disagree Strongly Disagree

29. The current financial auditors in Zambia have capacity to carry out technical audits on construction projects (*please tick*)?

Strongly Agree Agree Not Sure Disagree Strongly Disagree

30. The conditions of contract should include a clause on the requirement of a technical audit being carried out at least once during the lifetime of a project (*please tick*)?

Strongly Agree Agree Not Sure Disagree Strongly Disagree

31. When should a technical auditor be appointed on a construction project (*please tick*)?

- At planning stage and included as one of the consultants
- At tender stage
- At award of contract in consultation with the contractor
- At completion but before final account
- Not sure

32. At what stage should the audit commence (*please tick*)?

- Project approval stage
- Invitation of tenders
- Execution of formal contract documents
- Financial and physical progress (20%, 40%, 80%) State percentage
- Practical completion
- Expiry of defects liability period / final account
- On suspicion of economic crimes (fraud)
- Not sure

33. What type of training is most appropriate for the technical auditor (*please tick*)?

- Auditing techniques (Accounting)
- Construction related field (Engineering, surveying)
- Both
- Not sure

34. Who should pay for the technical audit (*please tick*)?

- Client (Employer)
- Contractor
- Both
- Not sure

35. Today it is a requirement of financial institutions to publish their annual audit reports. Technical audit reports should also be made available to the public for projects above US\$ 1million (*please tick*)?

- | | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Strongly Agree | Agree | Not Sure | Disagree | Strongly Disagree |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

36. It is said that businesses have a legitimate right to preserve the confidentiality of their businesses and to limit disclosure by others so that business advantages may be retained. For particularly sensitive projects, nondisclosure agreements should be signed (*please tick*)?

- | | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Strongly Agree | Agree | Not Sure | Disagree | Strongly Disagree |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

37. What other comments do you have on technical auditing in the construction industry?

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The End!
Thank you for your time.

Please return the completed questionnaire to:

Balimu Mwiya Sichombo (0955 837400)
MEng Research Student

Appendix B:

Structured interview guide

B.1 Structured interview (open ended questions)

1.0 Interviewee & Company Details

1.1 Name of Company: _____

1.2 Which sector do you belong to (*please tick*)?

Consultancy	Contractor	Clientele	Manufacturing	Supplier	Other(<i>State</i>).....
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1.3 Position in Company: _____

1.4 Professional background: _____

1.5 Years of Experience in the Construction Industry: _____

2.0 Perception of the Zambian Construction Industry

2.1 The continuing prevalence of economic crimes (unethical practices) and poor quality work in construction projects requires stakeholders to take preventive measures. Kindly state any proactive strategies you are familiar with for the prevention of economic crimes in the Zambian construction industry?

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2.2 The competence of project consultants is coming under attack due to non – observance of standards, codes of practice etc. What can professional bodies do to arrest this situation?

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2.3 What can be done about the existing legal deterrents such as the Anti – Corruption Commission, Task Force and Auditor General’s Office to make them more effective in combating economic crimes in the Zambian construction industry?

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3.0 Technical Auditing

This is an independent and objective assessment of the effectiveness and efficiency of a company’s operations.

3.1 What is your experience with technical auditing?

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3.2 Are you aware of any local companies with the capacity to carry out technical audits on construction projects?

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3.3 What do you think some of the technical audit guidelines should be?

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3.4 Could you state some of the benefits of technical auditing?

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3.5 It is said that the technical audit function is best carried out by a technical person or organisation competent in the specified field being audited **True of False?**

.....

3.6 Would you recommend introduction of whistle blowing systems such as hotlines, suggestion boxes, anonymous reporting etc. specifically for the Zambian construction industry?

Yes

No

Not sure

B.2 List of targeted organisation to be interviewed

S/No.	Position	Institution	Construction sector
1.	Engineer	NRFA	Clientele
2.	Director Social Infrastructure and Housing	NHA	Clientele
3.	Managing Partner	Chalwa Associates	Consultancy
4.	Managing Partner	Zulu Burrow	Consultancy
5.	Director	RDA	Contractor
6.	Quantity Surveyor	Turner Construction	Contractor
7.	Internal Auditor	LaFarge Zambia	Manufacturer
8.	Marketing Manager	Kafue Steel	Manufacturer
9.	Director	NCC	Construction Industry Regulator
10.	Auditor	AGO	Auditing

Appendix C:

**Case study project
particulars**

C.1 Case Study A: Rehabilitation of M6 Lusaka – Chirundu Road

Project particulars

Name of project:	Rehabilitation of 34.7km portion of T2 between Lusaka and Chirundu Km 75 to Km 109.7
Client/Employer:	Ministry of Works and Supply
Funding Agency:	World Bank / IDA
Consultants:	Africon in association with Brian Colquhoun Hugh O'Donnell & Partners (BCHOD)
Contractor:	China Henan International Cooperation Group Co. Ltd (CHICO)
Contract value:	K 110,655,185,204.00
Commencement date:	01 November, 2005
Completion date:	30 April 2007
Period of performance:	18 months

Project scope

The road project was the southern portion of T2 that originated at the southern end of the Lusaka Central Business District and ended at the Zambian Border post on the main Lusaka-Harare link. The road passed through Chilanga and Kafue and Trunk road T1 to Livingstone. It intersected the T2 at Km 55.20. Structural tests done on the existing road indicated that the whole road from Kafue Bridge to the Chirundu Border (34.7Km) required rehabilitation. However, due to limited resources, only the escarpment section of the road from Km 75.0 to Km 109.7 (34Km) was rehabilitated at an initial contract sum of K 110,655,185,204.00. The scope of works generally included:

- widening of the existing road formation to allow for cross-section geometry of 2 x 3.5m lanes and 2 x 2m surfaced shoulders;
- construction of auxiliary/climbing lanes where required;
- reduction of steep grades and improvement in traffic safety;
- reconstruction of road pavement layers; and
- reconstruction of some bridges and improvements to the vertical geometry.

The contract had a payment requirement of 90 percent in US Dollar and 10 percent in the local currency Kwacha (K).

C.2 Case study B: Presidential Housing Initiative

The government established the Presidential Housing Initiative on 5th November 1998. The purpose of PHI was to construct affordable dwelling units for sale. According to the government, PHI was to operate as a unit within National Housing Authority (NHA) and was to be spearheaded by a management committee appointed by the Republican President. The main objectives for establishing PHI were to:

- revive housing construction in order to enhance home ownership among Zambians and ease the demand for quality housing;
- upgrade unplanned settlements and create employment; and
- create employment.

In order to achieve the above objectives, government in principle approved the amendment of the NHA Act of 1971 to provide for the housing initiative. In addition, government also authorised the transfer of ownership and proceeds of the sale of parastatal housing stocks under the custody of Zambia Privatisation agency (ZPA), Indeco Estate Development company, Zambia Industrial Mining Corporation (ZIMCO) properties, Zambia Wholesale and Marketing Company and former National Marketing Board (NAMBOARD) houses to NHA and mandated it to manage Mulungushi Village and Conference Centre on its behalf. NHA was mandated to dispose of the housing stock and use the proceeds to finance the construction of infrastructure and houses, including the acquisition of houses. Government also approved the use of proceeds from the sale of government pool houses to construct houses so that, among others, public officers who did not benefit from the sale of government pool houses such as soldiers, policemen, teachers and others in institutional houses could benefit by owning houses. Despite government's decision to amend the NHA Act in order to incorporate PHI as a unit, this was not done. Nevertheless, PHI continued to operate as an entity from NHA although it was neither registered under the Companies Act nor established as a statutory board.

PHI was given two sites on which to construct new houses namely; Bennie Mwiinga site in Lusaka and Twapia site in Ndola. PHI attempted to acquire a site in Siavonga but did not succeed. During the period under review PHI received a total of K32,269,698,934.00, constructed 425 houses and offered 229 for sale. Payment to contractors totalled K17,610,827,085.

C.3 Case study C: Rehabilitation of Mukuni Park, Livingstone

Project particulars

Name of project:	Rehabilitation and Enhancement of the Mukuni Park and its facilities in Livingstone
Client/Employer:	Livingstone City Council
Funding Agency:	World Bank financed under IDA Credit No. 3966 ZA
Consultants:	Habiconsult, P.O Box 32425, Lusaka in association with ASCO
Contractor:	Pozzolona Engineers and Builders Limited
Contract value:	K 1,726,726,500.00
Commencement date:	16th October,2006.
Completion date:	21st February,,2008
Period of performance	62 weeks

Project scope

The works comprised the rehabilitation and upgrading of Mukuni Park and its facilities in Livingstone for the Livingstone City Council. New buildings to be constructed include Curio Sheds, Information and Heritage Centre, Ablution block, Café and Offices/Stores for Park Superintendent. Existing toilets were to be rehabilitated to match the new concept and theme for the park. Additional works included rehabilitation of pathways, general landscaping, lighting, provision of borehole and water tank and general upgrading of the surroundings.

The contractor, Pozzolona Engineers and Builders Limited was the lowest evaluated responsive bidder but the corrected bid price of K 2,516,113,540.00 was beyond the estimated cost of the proposed works. This amount was negotiated to K1,726,726,500.00 by omitting the construction of the Café and new ablution block, reduction of provisional sums by 30 percent and reduction in scope of rehabilitating existing toilets by 50 percent.

The contract had a payment requirement of 100 percent in Kwacha (K), the local currency.

Appendix D: Model validation questionnaire

D.1 Validation questionnaire cover letter



School of Engineering

Department of Civil & Environmental Engineering,

University of Zambia, Lusaka

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Dear Sir/Madam,

Questionnaire Survey - Validation of the proposed model for regulatory technical auditing of construction projects

In concluding the research study on the “Need for Technical Auditing in the Zambian Construction Industry” a proposed model has been developed. I write to seek your assistance in answering the attached questionnaire for the validation of my research findings.

The validation will assess the functionality, usefulness and usability of the proposed model. Your responses will be held confidential and used purely for academic purposes.

Thank you for contributing to the proposed model by answering the accompanying questions.

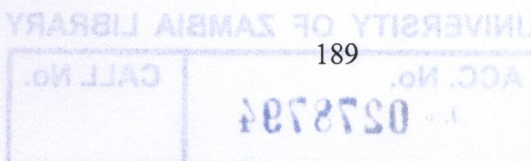
Yours faithfully,

Balimu Mwiya Sichombo

MEng Research Student

Email: bsicho@yahoo.com

Mobile: 0955 837400



D.3 List of participants for validation of proposed model

S/No.	Position	Institution	Construction sector
1.	Engineer	NRFA	Clientele
2.	Director Social Infrastructure and Housing	NHA	Clientele
3.	Managing Partner	Chalwa Associates	Consultancy
4.	Managing Partner	Zulu Burrow	Consultancy
5.	Director	RDA	Contractor
6.	Quantity Surveyor	Turner Construction	Contractor
7.	Internal Auditor	Lafarge Zambia	Manufacturer
8.	Marketing Manager	Kafue Steel	Manufacturer
9.	Director	NCC	Construction Industry Regulator
10.	Auditor	AGO	Auditing