An investigation into causes, effects and measures for minimising time overruns in road construction projects in Malawi: the case of Roads Authority

A dissertation submitted in partial fulfilment for the requirements of a

Master of Science Degree in Project Management

By

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May, 2016
DECLARATION

I declare that this thesis entitled “An Investigation into causes, effects and measures for minimising time overruns in road construction projects in Malawi: the case of Roads Authority” is the result of my own except as in references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree in any other university that I know of.

_________________________                     ________________
Aamon Monty Mukasera                     Date

This project report has been submitted with our approval as University Supervisors.

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DEDICATION

I dedicate this thesis report to my late parent for the support and encouragement in my education, to my wife for the understanding and unconditional love, to my sons Papa (Onhivaha) and Tata (Nohakhelha) for escorts to school every weekend; and to my relatives, friends and colleagues who were always there for me on the hour of need.
ACKNOWLEDGEMENT

First and foremost I would like to thank the management of Roads Authority for giving me an opportunity to study for this Masters Degree course whilst still working and offering me a chance to use facilities; and also members of staff for the dissertation input.

Secondly I would like to express my sincere appreciation and gratitude to my supervisors, Mr. Duncan Grant (University of Bolton) and Mr. Landson Thindwa (Malawi Institute of Management) for the support and guidance rendered to me from the time of formulating the proposal, literature review, data collection and report preparation. Contributions from the supervisors immensely contributed to the successful completion of this research.

Lastly I would like to extend my vote of thanks to all participants who took time to respond to the questionnaire and offered guidance. Valuable support from workmates, my superiors at work, engineers and technicians from various organisations is recognised as well. Special thanks to Mr. Richard Manjanja for the interest in seeing the successful completion of this research.
ABSTRACT

Construction projects have a worldwide history of being completed beyond their schedule durations. Road construction is not an exception, as such client organisations end up paying huge sums of money in compensations for delayed projects while contractors on the other hand suffer losses from delayed projects.

The study aims at identifying causes, effects and measures for minimising time overruns in road construction projects in Malawi. A detailed literature review and structured questionnaire surveys were used for the study; and results revealed the presence of time overruns in road construction projects in Malawi.

Results of the study have revealed that inadequate planning, inability to pre-finance projects, delays in processing contractors’ payments, delayed mobilisation to project sites, slow decision making, delayed approvals for scope changes, workers risky behaviours, poor planning and scheduling, price fluctuations, political interference, equipment unavailability, inclement weather as causes of time overruns in projects.

Time overruns in road projects have cost overruns, extension of time, claims, disputes, contract termination, loss of profits, project abandonment, poor quality of work due to hurried execution, idling of resources, bankruptcy, arbitration, litigation and loss of employees as their effects.

The study has established the following measures which when effectively implemented will minimise time overruns in road construction projects: proper project planning and scheduling, effective and efficient management of sites and supervision services, availability of complete designs at project commencement, coordination on site, adherence to specification, use of appropriate construction methods; use of
proper and modern equipment, conducting frequent progress meetings, construction according to drawings and use of up to date technology.

As a way of mitigating time overruns in road construction projects in Malawi, the study recommends the following: ensuring secure and reliable funding for the entire project duration; availability of complete designs at project commencement; awarding contracts to technically and financially sound contractors; ensure availability by revamping activities of PVHO; implementation of measures which will counter the occurrence of time overruns in projects; and holding of frequent progress site meetings.
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<tr>
<td>ANRP</td>
<td>Annual National Roads Plan</td>
</tr>
<tr>
<td>CPM</td>
<td>Critical Path Method</td>
</tr>
<tr>
<td>GoM</td>
<td>Government of Malawi</td>
</tr>
<tr>
<td>MoF</td>
<td>Ministry of Finance</td>
</tr>
<tr>
<td>MoTPI</td>
<td>Ministry of Transport and Public Infrastructure</td>
</tr>
<tr>
<td>MoW</td>
<td>Ministry of Works and Supplies</td>
</tr>
<tr>
<td>UAE</td>
<td>United Arab Emirates</td>
</tr>
<tr>
<td>NCIC</td>
<td>National Construction Industry Council of Malawi</td>
</tr>
<tr>
<td>PCR</td>
<td>Project Completion Report</td>
</tr>
<tr>
<td>RA</td>
<td>Road Authority</td>
</tr>
<tr>
<td>RFA</td>
<td>Road Fund Administration</td>
</tr>
<tr>
<td>RMI</td>
<td>Road Maintenance Initiative</td>
</tr>
<tr>
<td>SSA</td>
<td>Sub-Saharan Africa</td>
</tr>
<tr>
<td>USA</td>
<td>United States of America</td>
</tr>
<tr>
<td>Km</td>
<td>Kilometre</td>
</tr>
<tr>
<td>PVHO</td>
<td>Plant and Vehicle Hire Organisation</td>
</tr>
</tbody>
</table>
CHAPTER 1: INTRODUCTION

1.0 CHAPTER INTRODUCTION

1.1 BACKGROUND

This dissertation aims at finding causes, effects and determining measures for minimising time overruns in the road construction projects in Malawi. Outlined in this introductory chapter are highlights of various components of the study and structure which the study will follow. The components of the study comprise of the aim, problem statement, objectives, research questions, purpose, rationale and motivation for the study.

1.1.1 Construction Time Overruns

Construction projects have a worldwide history of exceeding their time durations and initial budgets when completed (Farid & El-sayegh, 2006). Kaming, et al., (1997) define time overruns as delays in project implementation period beyond the contract duration. Assaf & Al-Hejji (2006) define time overruns as time slip from the initial planned time; and these are a common phenomenon in construction projects. Studies by (Assaf & Al-Hejji, 2006) on time overruns indicated that project owners suffer from revenue losses, while contractors are affected by high overhead costs due to increased working durations, high material costs due to inflation and increased labour costs if projects experience time overruns.

1.2 AIM OF THE STUDY

The aim of this study is get an insight into causes of time overruns; effects and lastly identifying measures for minimising time overruns in road construction projects in Malawi.
1.3 THE PROBLEM STATEMENT

Road construction projects in Malawi are rarely completed on time; as such there is a need to identify causes of time overruns, determine their effects and identify measures which can minimise the occurrence of time overruns. This compounded by quarterly report of the RA’s Construction Department report as at 31st December, 2015 where it was indicated that road construction projects had exceeded their scheduled durations. *(See Table 1).*

1.4 OBJECTIVES OF THE STUDY

The study objectives are as listed below:

- to determine factors that cause time overruns in road construction projects in Malawi;
- to analyse effects of time overruns in road construction projects in Malawi;
- to recommend measures for minimising time overruns in road construction projects in Malawi.

1.5 RESEARCH QUESTIONS

The research will attempt to answer the following questions:

(i) What are the factors that causes time overruns in the road construction industry in Malawi?

(ii) What are the effects of time overruns in the road construction industry in Malawi?

(iii) What measures can be employed to minimise the occurrence of time overruns in the road construction industry in Malawi?
1.6 RATIONALE OF THE STUDY

The rationale behind the study was an article which appeared in the Nation Newspaper of 30\textsuperscript{th} May, 2015 (\textit{local daily}) where it was reported that the Malawi Government owes construction contractors over MK 14.63 billion (US$ 32.51 million) of tax payers’ money in interests due to delayed payment and time overruns in road construction projects.

Quarterly report of RA’s Construction Department of December, 2015 highlights the time overruns experienced in road construction projects in the past 5-10 years (\textit{See Table 1})

As such, the study would like to establish factors that cause time overruns, their effects and to identify measures which can minimise the occurrence of time overruns in road construction projects in Malawi.
### Table 1: Time Overruns in RA Road Construction Projects

<table>
<thead>
<tr>
<th>No.</th>
<th>Project Name and Description</th>
<th>Source of Funding</th>
<th>Length (km)</th>
<th>Start Date</th>
<th>Original Completion Date</th>
<th>Revised Completion Date</th>
<th>Time Overrun Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mzimba - Mzalangwe road upgrading from earth to bitumen standard class 2</td>
<td>GoM</td>
<td>62</td>
<td>1-May-09</td>
<td>31-Dec-12</td>
<td>31-Dec-14</td>
<td>24 months</td>
</tr>
<tr>
<td>2</td>
<td>Lumbadzi - Dowa - Chezi road upgrading from earth to bitumen standard class 1 + Namitete hospital road upgrading from earth to low volume sealed road</td>
<td>GoM</td>
<td>39</td>
<td>1-Jul-08</td>
<td>1-Jul-11</td>
<td>30-Dec-15</td>
<td>36 months</td>
</tr>
<tr>
<td>3</td>
<td>Goliati - Chiperone + Mulanje Mission Hospital Road and Thyolo Market Road upgrading from earth to bitumen standard class 1</td>
<td>GoM</td>
<td>21.1</td>
<td>8-Sep-08</td>
<td>7-May-10</td>
<td>17-Mar-12</td>
<td>24 months</td>
</tr>
<tr>
<td>4</td>
<td>Ekwendeni - Ezondweni Road Upgrading from Earth to Bitumen Standard Class 2</td>
<td>GoM</td>
<td>25</td>
<td>17-Apr-08</td>
<td>17-Apr-10</td>
<td>15-Dec-12</td>
<td>31 months</td>
</tr>
<tr>
<td>5</td>
<td>Nsanje - Bangula Road Upgrading from Earth to Bitumen Standard Class 1</td>
<td>GoM</td>
<td>48</td>
<td>17-Apr-08</td>
<td>24-Apr-10</td>
<td>17-Mar-11</td>
<td>9 months</td>
</tr>
<tr>
<td>6</td>
<td>Lilongwe - Nsipe Road: Dedza-Nsipe Section Periodic Maintenance and Rehabilitation</td>
<td>GoM</td>
<td>83.5</td>
<td>21-Nov-08</td>
<td>30-Nov-12</td>
<td>2-Feb-13</td>
<td>3 months</td>
</tr>
<tr>
<td>7</td>
<td>Chikwawa - Nchalo - Bangula Road: Ngabu - Bangula Section Periodic Maintenance and Rehabilitation</td>
<td>GoM</td>
<td>35</td>
<td>3-Sep-12</td>
<td>2-Sep-14</td>
<td>2-Dec-14</td>
<td>3 months</td>
</tr>
<tr>
<td>8</td>
<td>Chikwawa - Bangula road: Chikwawa- Ngabu Section periodic maintenance and rehabilitation</td>
<td>EU</td>
<td>46</td>
<td>24-Nov-08</td>
<td>23-Nov-10</td>
<td>4-Aug-12</td>
<td>22 months</td>
</tr>
<tr>
<td>9</td>
<td>Mchinji - Kawere Road Upgrading from Earth to Low Volume Sealed road</td>
<td>EU</td>
<td>26</td>
<td>25-May-10</td>
<td>23-Nov-11</td>
<td>2-Nov-12</td>
<td>18 months</td>
</tr>
<tr>
<td>10</td>
<td>Lilongwe City West Bypass new construction to bitumen standard class 1 road</td>
<td>AfDB &amp; GoM</td>
<td>13.4</td>
<td>19-Nov-12</td>
<td>19-May-14</td>
<td>12-Nov-14</td>
<td>6 months</td>
</tr>
<tr>
<td>11</td>
<td>Blantyre - Zomba Paved Road Reconstruction</td>
<td>AfDB &amp; GoM</td>
<td>60</td>
<td>19-Mar-12</td>
<td>18-Mar-14</td>
<td>13-Aug-14</td>
<td>5 months</td>
</tr>
</tbody>
</table>

1.7 MOTIVATION FOR THE STUDY

The motivation for the study is that it will contribute to the body of knowledge on causes, effects and measure for minimising time overruns in road construction projects. The results of the study will enhance a better understanding of the different causes, effects and ways of minimising time overruns in road construction projects in Malawi by professionals involved with road construction.
CHAPTER 2: LITERATURE REVIEW

2.0 CHAPTER INTRODUCTION

This chapter gives a theoretical review and perceptions of construction time overruns in the construction industry worlds over. The chapter will give an overview of the transport sector in Malawi, discuss past theories of causes, effects and measures which were employed to mitigate and possibly eliminate the occurrence of time overruns in construction projects.

2.1 OVERVIEW OF THE TRANSPORT SECTOR IN MALAWI

The transport sector in Malawi comprises of road, rail, water and air (Kulemeka, 2010) and has in the last five years had its share on the national economy averaging 4.4% of the country’s GDP (Kulemeka, 2010). Being a landlocked Malawi relies on road and rail transport in handling freight and passenger traffic. However, washing away of the rail embankment at Chiromo Bridge in Nsanje District and the dilapidated 77km section of the rail line at Nacala Port has resulted in making road transport as the easily accessible and affordable means of transporting goods and passengers in Malawi (Ministry of Transport and Public Infrastructure, 2011).

2.2 MALAWI PUBLIC ROAD NETWORK

Malawi’s national policy on transport seeks to provide a safe and competitive transport environment which is commercially viable, economically sustainable and environmentally friendly (Emuze & S.Kadangwe, 2013).

In the roads sector, the policy vies for road network that enables the movement of people and goods within, into and out of Malawi whilst contributing to the country’s development. Malawi can benefit from an improved road network through reduced lead time on exports, cost reduction on domestic trucking, reduced cost on cross-
border trade and linkage of production and consuming areas at national, sub-regional and international levels (Emuze & S.Kadangwe, 2013).

Malawi’s public road network is categorised into main, secondary, tertiary, urban and district roads (Roads Authority, 2011). The five categories are defined below:

(a) **main roads**: designated inter-territorial roads that provide high mobility degree by connecting provincial capitals and serving as international corridors.

(b) **secondary roads**: designated roads outside cities and towns that provide high mobility degree by linking populations and production centres to main road network.

(c) **tertiary roads**: designated roads outside cities and towns that link collector roads to arterial roads thereby providing shorter trips and feeding arterial road network

(d) **district roads**: roads designated in consultation with DA and found outside town and provide intermediate level of service through connection of local population, developed area and districts to the principal arterial system; and

(e) **urban roads**: undesignated roads in urban comprising of arterial and collector roads and provide shorter trips at low speeds in smaller communities.

### 2.2.1 Management of Roads in Malawi

Malawi’s transport sector is dominated by roads which locally handle 70% of the freight and 99% of passenger traffic while handling 90% of both international freight and passenger traffic (Roads Authority, 2012). Roads usually succumb to the large volumes of freight and passenger traffic, resulting in reduced design life spans;
hence government placing great emphasis on maintenance, rehabilitation and construction of roads in Malawi.

Prior to 1998, all road works were under Ministry of Works and Supplies (MoW) with implementation funding from Ministry of Finance (MoF). However, the country’s’ poor economic state coupled with competing demands for financial resources from other sectors, allocations for road works failed to match with maintenance requirements as a result service delivery in road infrastructure management and development deteriorated immensely as evidenced in the early 1990’s (Kulemeka, 2010). In 1995, GoM instituted the Road Maintenance Initiative (RMI) studies to effectively address management and development of road infrastructure and funding problems (Kulemeka, 2010) with an aim of ensuring sustainability on investments made on road networks through revenue generation from road users.

Successful implementation of RMI study results required the establishment of an agency outside the public service to manage the road network and account for resources in line with the set goals of maintaining and developing the road infrastructure. In 1998, National Roads Authority (NRA) through Act of Parliament was created with the following mandates:

- ensuring maintenance and rehabilitation of public roads throughout the year
- raising funds for maintenance and rehabilitation for all public roads
- advising the Minister, and where appropriate Local Government Minister on efficient and effective preparation and implementation of ANRPs; and controlling overloaded vehicles

In 2006, NRA Act of 1997 was repealed as a way of improving accountability and transparency in road network management and resulted in the formation of Roads
Authority (RA) through an Act of Parliament No.: 3 of 2006 and Road Fund Administration (RFA) through another Act of Parliament No.: 4 of 2006 (Roads Authority, 2011).

2.2.2 Road Network Coverage

Malawi has road network of 15,451 km, of which 4,073 km are of paved surface representing 29% (Roads Authority, 2010). In 2010, Ministry of Transport and Public Infrastructure (MoTPI) carried out studies on the road network and identified an additional 9,478 km of undesignated road network which serve rural communities resulting in a total road network of 25,000 km, upon gazetting of the new road network classification.

Table 2: Malawi Road Network – 2010

<table>
<thead>
<tr>
<th>Class</th>
<th>Pavement Type</th>
<th>Mileage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Paved : Km</td>
<td>Unpaved : Km</td>
</tr>
<tr>
<td>Main</td>
<td>2,809</td>
<td>548</td>
</tr>
<tr>
<td>Secondary</td>
<td>442</td>
<td>2,683</td>
</tr>
<tr>
<td>Tertiary</td>
<td>44</td>
<td>4,077</td>
</tr>
<tr>
<td>District</td>
<td>8</td>
<td>3,492</td>
</tr>
<tr>
<td>Urban</td>
<td>770</td>
<td>578</td>
</tr>
<tr>
<td><strong>Sub-total</strong></td>
<td>4,073</td>
<td>11,378</td>
</tr>
<tr>
<td>Undesignated Community Roads</td>
<td>9,478</td>
<td>9,478</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>8,146</td>
<td>20,856</td>
</tr>
</tbody>
</table>

*Source: RA Annual Report, 2012 - pg 25*

2.2.3 Road Condition

As of 30th June, 2010 conditions of the paved road network indicated that 60% was in a good state, 33% in fair and 7% in poor states while unpaved roads had 48% in good, 26% of fair and 26% of poor conditions respectively. In summary the total
road network had 33% of good, 38% of fair and 29% of poor condition. See table below.

Table 3: Malawi Road Condition – 2010

<table>
<thead>
<tr>
<th>Condition</th>
<th>Paved</th>
<th>Unpaved</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Km</td>
<td>% Share</td>
<td>Km</td>
</tr>
<tr>
<td>Good</td>
<td>2,426</td>
<td>60</td>
<td>5,000</td>
</tr>
<tr>
<td>Fair</td>
<td>1,361</td>
<td>33</td>
<td>2,654</td>
</tr>
<tr>
<td>Poor</td>
<td>286</td>
<td>7</td>
<td>3,724</td>
</tr>
<tr>
<td>Total</td>
<td>4,073</td>
<td>100</td>
<td>11,378</td>
</tr>
</tbody>
</table>

Source: RA Annual Report, 2012 - pg. 25

2.2.4 Responsibilities on the Road Network

The responsibility of maintaining, rehabilitation and constructing public roads in Malawi is entrusted in RA. Further, RA is entrusted with advising Minister responsible for roads; Local Government Minister on preparation, effective and efficient preparation of ANRPs as referred to in Section 22 of Roads Act. However, Public Roads Act of 1962 gave Local Assemblies (LA) the responsibility of maintain urban and district roads under their jurisdiction.

Act of Parliament No.:4 of 2006 gave RFA responsibility to administer funds for all recurrent roads programmes.
Table 4: Management Responsibility of the Road Network

<table>
<thead>
<tr>
<th>Road Class</th>
<th>Current</th>
<th>Reclassified Not Gazetted</th>
<th>Organisation for Road Management</th>
<th>Source of Responsible for Funds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main</td>
<td>3,357</td>
<td>4,004</td>
<td>RA</td>
<td>RFA</td>
</tr>
<tr>
<td>Secondary</td>
<td>3,125</td>
<td>4,249</td>
<td>RA</td>
<td>RFA</td>
</tr>
<tr>
<td>Tertiary</td>
<td>4,121</td>
<td>0</td>
<td>RA</td>
<td>RFA</td>
</tr>
<tr>
<td>District</td>
<td>3,500</td>
<td>8,085</td>
<td>RA/LA</td>
<td>RFA/LA</td>
</tr>
<tr>
<td>Urban</td>
<td>1,348</td>
<td>1,580</td>
<td>RA/LA</td>
<td>RFA/LA</td>
</tr>
<tr>
<td>Community</td>
<td>0</td>
<td>7,019</td>
<td>LA</td>
<td>RFA/LA/Donors</td>
</tr>
<tr>
<td>TOTAL</td>
<td>15,451</td>
<td>24,937</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: RA Annual Report, 2012 - pg. 26

2.3 STAKEHOLDERS IN ROAD CONSTRUCTION IN MALAWI

2.3.1 Ministry of Transport and Public Infrastructure (MoTPI)

This is being the mother ministry, is responsible for policy formulation in the roads sector, donor fund coordination, implementation and monitoring of road construction projects. The focus of the ministry is on the provision of a well coordinated transport environment that fosters a safe and competitive operation of commercially viable, financially sustainable, and environmentally friendly transport services, enterprise for social development, provision of an all weather road network and regulation of construction and maintenance works through law enforcement policies and standards on the national road network.

2.3.2 Roads Authority (RA)

RA is a government institution which was established through Act of Parliament No.: 3 of 2006 to manage recurrent programmes funded by RFA and development programmes which are funded by GoM through its development budget and donors.
2.3.3 Road Fund Administration (RFA)

RFA is a government institution which was established through Act of Parliament No.: 4 of 2006 of Parliament to raise, administer and account for funds for maintenance, rehabilitation and construction of public roads in Malawi. RFA sources its funds from fuel levy, parliament appropriations, loans, transit fees, grants, road charges and donations to effect routine and periodic road maintenance, road safety activities, emergency works, feasibility studies and road traffic management studies.

Through its audit department, RFA monitor road works programmes through physical site inspections, progress tracking through desk reviews of consultants’ progress reports and review of contractors’ and consultants’ payments certificates to monitor financial progress.

2.3.4 National Construction Industry Council of Malawi (NCIC)

NCIC is a government institution which was established through an Act of Parliament of 1996 with a mandate to be regulating, developing and promoting the construction industry in Malawi. (GoM, 1996). NCIC’s construction policy ensures that there is an enabling environment for the development of a vibrant, efficient and sustainable local construction industry.

2.3.5 Consulting Firms

Consulting firms are key stakeholders in road construction projects since they are entrusted with the design, supervision of maintenance, rehabilitation and construction of roads. Consultants also ensure works being implemented adhere to specifications, within budget and the stipulated duration.
2.3.6 Contractors

Contractors in a project are firms who are entrusted with provision of materials, labour, equipment and other related services in order to execute works on a project (Lock, 2007).

2.4 TIME OVERRUNS IN ROAD PROJECS IN PERSPECTIVE

The importance of roads in the socio-economic development and subsequent growth of any nation cannot be over emphasised. As such, completion of road construction in time is of paramount importance. Timely completion of road projects is influenced by several factors; time being one such important factor project management (Divakar & Subramanian, 2009); (Nkado, 1995) and (Latham, 1994).

In Malawi, time overruns are a common scenario in construction projects despite the causes being known (Kamanga & Steyn, 2013), as such the study will provide channels through which energies and resources of technocrats can be directed into in mitigating time overruns in construction projects.

2.5 CAUSES OF TIME OVERRUNS IN CONSTRUCTION PROJECTS

Success in construction projects is when projects are delivered within the planned budget, duration, and with the expected quality (Owolabi, et al., 2014) and (Frimpong, et al., 2003). Inability to complete the execution of construction works within the planned duration is referred to as time overrun (Kaming, et al., 1997) and (Alkhathami, 2004).

In recent times, construction projects have hardly been completed within their stipulated durations due to various causes (Kamanga & Steyn, 2013). As such, project managers should ensure that construction projects are completed within their stipulated durations in order to avoid the corresponding effects of time overruns.
2.5.1 Categorisation of Time Overruns in Construction Projects

Wei (2010) categorised causes of time overruns in construction project based on the causal factor and the one responsible for the time overrun. As such, it is important to acquire ample knowledge on the cause of time overruns before devising strategies for mitigating and eliminating effects of time overruns (Braimah, 2008).

The study has adopted an approach by (Theodore, 2009) in categorising time overruns and the discussing them in detail as follows:

- critical or non-critical
- excusable or non-excusable
- compensable or non-compensable
- concurrent or non-concurrent

2.5.1.1 Critical and Non-critical Time Overruns

Theodore (2009) define critical time overruns as overruns that affect project completion date or milestone date and non-critical time overruns as overruns that have no effect on the project completion date or milestone date. Theodore (2009) explains time overruns concept is derived from the critical path method (CPM) in scheduling project activities. In all projects, there are activities on the critical path and any delays in execution such activities result in time overruns.

During project implementation, it is imperative to seriously consider critical time overruns since they have an effect on the overall project duration unlike non critical ones.
2.5.1.2 **Excusable and Non-excusable Time Overruns**

Theodore (2009) narrated that all time overruns are either excusable or non-excusable and further explained that excusable time overruns are caused by unforeseeable events which beyond contractors’ control while non-excusable time overruns are caused by events which are within contractors’ control and are foreseeable. Contractors are entitled to time extensions when critical project activities are affected by excusable time overruns; while an adjustment on the float time is effected when non-critical activities are affected by excusable time overruns (Alkass, et al., 1996).

Excusable time overruns are effected in the event of severe weather, floods, strikes, fire, owner related changes, differing site conditions, change in government policies and government/stakeholders interventions whilst non-excusable time overruns are a result of delayed completion of works by sub-contractors, delayed performance by suppliers, faulty workmanship by main/sub-contractors, strikes due to contractor’s unwillingness to meet labourers’ representative or unfair labour laws (Theodore, 2009).

Contractors or their suppliers are the main causes of non-excusable time overruns; as such they are entitled to any relief and the only way out is to accelerate works to make up for lost time or compensating the client

2.5.1.3 **Compensable and Non-Compensable Time Overruns**

Compensable time overruns are overruns where contractors are entitled to time extensions and an additional compensation in form of payment for overrun experienced while non-compensable time overruns are overruns resulting from excusable delays and contractors are entitled to extension of time but not payment compensations for overrun (Theodore, 2009).
Compensations are effected on compensable time overruns which in most cases are caused by clients’ agents. In principle compensations cannot be effected on non-compensable time overruns even though they are excusable.

2.5.1.4 Concurrent Time Overruns

Concurrent time overruns come into effect when two or more overruns occur at the same time and affect project durations (Theodore, 2009). Contractors cannot raise claims, apply for time extensions and seek compensations on all concurrent time overruns; hence the need to analyse and consider causes of time overruns, by taking note of the time, the overrun occurred, its impact on the project, its duration and the available floats in the time schedule (Theodore, 2009).

Further, analysis of concurrent time overruns by (Theodore, 2009) concluded that where there are more than two excusable delays, extension of time is granted when the time overruns are excusable and non-excusable; or the time overrun is shared between the client and the contractor or else circumstances determine the effectiveness of granting a time extension.

2.5.2 Causes of Time Overruns in Construction Projects

Construction time overruns in construction projects are found at caused by several factors. Categories of time overrun causes were compiled after an extensive literature review which was based on by (Theodore, 2009) where clients, consultants, contractors, equipment, materials, labour and external factors were identified as the cause of time overruns in projects.

2.5.2.1 Client Related Causes of Time Overruns

Literature review revealed time overruns caused by clients are one of the major concerns in the construction projects.
Assaf & Al-Hejji (2006) identified bureaucratic tendencies in decision making, delayed design and revision approvals, delays in processing certificates for executed works, delayed material sample approvals, delayed site handovers, poor coordination and communication with key stakeholders, conflicts in co-sponsored projects, suspension of works and lack of incentives for contractors who finish works on time as factors that causes time overruns in construction projects.

Clients in Kenya were faulted on time overruns due to their unrealistic estimations on project durations. A study (Kivaa, 2000) revealed that most project durations are determined through the estimators’ intuition and is based on experience and skill.

Memon (2014) in a study of contractors perspective on time overruns factors in Malaysia identified initial budget assessment errors, site hazards, insufficient project feasibility studies and multiple request on modifications as causes of time overruns in construction projects.

Alinaitwe, et al.( 2013) identified scope changes and delayed payments for completed works as cause of time overruns related to clients.

Sambasivan & Soon (2007), Aziz (2013) and Alaghbari, et al.,(2007) in their studies conducted in various contexts of the construction industry deduced the despite time overruns being a global phenomenon, they are prominent in developing countries unlike in developed countries. This is contrast with findings by (Okeyo, et al., 2015) who indicated that countries like Canada, United States of America, Australia and Britain have also had their share of time overruns in construction projects. Okeyo, et al.,(2015) citing De Souza (2009) explained tha several construction projects Canada experienced time overruns due to reduced funding by donors, breakdown in communication between contractual perties, delays in disbursement of funds, long legislative procedures; while (SNL Financial, 2010) revealed tha a pipeline project in Florida Stae and Bahamas experienced time overruns due to design changes.
In Malawi, (Kamanga & Steyn, 2013) identified delays in processing payments for contractors and clients’ financial difficulties as the causes of time overruns in construction projects related to clients. These findings are in agreement with results of similar studies conducted by (Akgobe, et al., 2013) in Benin, (El-Razek, et al., 2008) in Egypt and (Le-Hoai, et al., 2008) in Vietnam.

In summarising the client related causes of time overruns in construction projects, (Theodore, 2009) listed the following nine causes of time overruns: delays in processing payments for contractors, delays in furnishing and delivering sites to contractors, changes in drawings during construction by clients, delays in approving drawings and sample materials, poor communication and coordination between contractual parties, delays in decision making process, conflicts in projects which are jointly owned and suspension of works by the clients.

2.5.2.2 Consultant Related Causes of Time Overruns

Osman, et al. (2009) and Wei (2010) revealed that consultants have had their share in causing time overruns in construction projects. Delays in approving changes in the scope of works were a major cause of time overruns which was related to consultants.

Further studies by (Baloyi & Bekker, 2011) on consultants’ actions and inactions on construction projects identified issuance of incomplete drawings and delays in issuing instructions as factors causing time overruns in projects; this is supported by findings of study by Alaghbari, et al., (2007) who identified delays in deploying personnel on site and delays in issuing instructions as causes of time overruns in construction projects.

However, a study by (Mohammed & Isah, 2012) and (Talukhaba, 1999) in Nigeria and Kenya respectively, identified errors in design as a cause of time overruns in
construction projects since contractors are made for consultants while they re-work on the designs.

Further, (Motaleb & Kishk, 2010) in UAE identified inexperience of consultants, while (Ren, et al., 2008) in Dubai had incomplete drawings, delayed approval of contract documents, incomplete contract documents, drawing and specification changes and durations taken to inspect completed works as the root causes of time overruns in construction projects.

In summary (Theodore, 2009) listed delays in approving major changes in the scope of work, poor coordination and communication, consultants’ staff inadequate experience, discrepancies and mistakes in design documents, delays in the production of design documents, inadequate and unclear details in construction drawings, insufficient data collection and surveys before designs and lack of advanced engineering design software as the causes of time overruns in construction projects.

**2.5.2.3 Contractor Related Causes of Time Overruns**

Contractors actions and inaction in implementing construction works have also resulted in time overruns. Ren, et al. (2008) established that the non-preparing of method statements, inadequate project financing, poor communication and construction mistakes are some of the causes of time overruns related to the contractor.

Studies by (Aigbavboa, et al., 2014) on time overruns in construction projects in Zambia identified difficulties in financing projects, conflicts emanating from sub-contractors’ work scheduling, re-working on construction errors, conflicts between contractor and collaborating partners, delays sub-contracted work, ineffective planning and scheduling of activities, changes in sub-contractors, use of unqualified
and inexperienced technical staff and delays in mobilising to project sites as causes of time overruns related to contractors; and this is in agreement findings of studies by (Frimpong, et al., 2003) in Ghana, (SNL Financial, 2010) in USA, and (Memon, 2014) in Malaysia.

Owolabi, et al. (2014) in Nigeria identified inadequate flow of information from consultants as one cause to time overruns in construction project. Theodore (2009) summarised the cause of time overruns related contractors in mobilisation delays to sites, difficulties in financing projects, ineffective planning and scheduling, construction errors resulting in re-works, conflicts in sub-contractors work scheduling, poor technical skills on contractors’ staff, delays in sub-contracting works, frequent change of sub-contractors, poor communication and coordination, use of improper construction methods, delayed completion of works by sub-contractors and conflicts between contractual parties.

### 2.5.2.4 Equipment Related Causes

Construction works in projects involve the use of large magnitudes of materials which in turn requires the use of equipment. Assaf & Al-Hejji (2006) identified breakdown of equipment and their shortage as the major causes of equipment related time overruns. A study by (Halikas, et al., 2010) in Uganda established that high costs of hiring/leasing equipment, difficulties in buying and transporting the equipment, it (Uganda) being a land locked country as the cause of overruns related to equipment while studies on equipment related time overruns by (Aigbavboa, et al., 2014) in Zambia identified frequent breakdowns, scarcity of equipment, operators’ inadequate skills in operating equipments, inefficiency and low productivity of equipment; and unavailability of high level technological equipment as
causes of time overruns in construction projects. These findings are in agreement with findings by (Wei, 2010).

In Gaza strip, (Enshassi, et al., 2009) established that equipment unavailability, equipment ineffectiveness and allocation of equipment low skilled operators as equipment related causes of time overruns while (Sambasivan & Soon, 2007) identified availability and condition of available equipment (i.e. old age) as the cause of time overruns in construction.

Further studies by (Rivas, et al., 2011) on construction companies in Chile established that time overruns are also caused low level of equipment operators’ skills and their coordination.

Theodore (2009) summarised equipment related causes of time overruns as follows: breakdown of equipment, equipment shortages, equipment operators’ low level skills, efficiency and low productivity of equipment, unavailability of high-tech mechanical equipment, use of obsolete equipment and usage of wrong equipment.

\[ \text{2.5.2.5 Material Related Causes} \]

Materials play an important role in the successful implementation of construction projects. However projects experience material related time due to several factors. An internet study carried out by (Moura & Teixeira, 2006) established that poor quality materials, poor scheduling, delayed procurement and specification changes are likely to cause time overruns in construction projects. In very extreme cases material type and quality can affect the safety of individuals on site.

Ochieng, et al. (2015) established that the quality of sub-surface materials in building construction projects in Kenya had effect on the timely completion of projects while (Akintoye & Fitzgerald, 2000) in UK found that changes in construction materials and unforeseeable changes in construction material prices had effects on timely
completion of projects. Further (Le-Hoai, et al., 2008) in a study of time overruns in large construction project in Vietnam identified price fluctuation as another cause of time overruns in construction projects.

Pourrostam & Ismail (2011) established that unavailability of materials and delays in delivering them to project sites contributed immensely to time overruns in Iranian construction projects while (Shaikh, et al., 2010) identified late delivery of materials as major factor contributing to time overruns in construction projects.

Theodore (2009) summarised the material related causes of time overruns in construction projects as follows: unavailability of construction materials in markets, material type changes during construction, delays in delivering materials, damage to sorted materials while they required urgently, delays in the manufacture of special building materials and delays in procuring materials

2.5.2.6 Labour Related Causes

A productive human resource plays an important role in the successful completion of construction projects.

Aigbavboa, et al. (2014), Assaf & Al-Hejji (2006) and Sambasivan & Soon (2007) in their respective studies, identified labour shortage, conflicts amongst workers, low levels of productivity and work permit processing delays as the causes of time overruns in projects related to labour.

Ndenguma (2013) identified lack of competent/qualified personnel, insufficient labour skills and failure to interpret drawing as some labour related causes of time overruns. Theodore (2009) in her study on challenges faced in implementing road mainenence projects in Malawi identified and ranked labour shortages, delays in processing work permits for expatriates, workers’ low labour productivity level and
personal worker conflicts as some of the labour related time overruns in construction projects.

2.5.2.7 Health and Safety Related Causes of Time Overruns

A health and secure works force plays an important role in the successful implementation of construction projects. However, inadequate health and safety measures in construction projects have resulted in loss of lives and time overruns in construction projects. Enshassi, et al. (2009) identified working in unsafe areas, accidents during construction works, failure to use safety and equipment during construction works, as causes of time overruns in construction projects. Further (Work Safe New Zealand, 2016) tired, sick or injured, making mistakes deliberately, taking minds off work issues, working in unsafe areas, pressure from bosses resulting in mistakes, short cuts on purpose (to save time) and use of faulty machinery or equipment on breakdown as risky behaviours at work places.

2.5.2.8 External Related Causes of Time Overruns

Literature review of the causes of time overruns presented in the foregone sections is mainly due to actions and inactions of the project. Construction time overruns which cannot be attributed to the project team are a result of external related factors.

Aigbavboa, et al. (2014) established that ground and sub-surface conditions effects, delays in issuing permits to expatriates, political interference, restrictions and traffic control on site and effects of weather on construction activities as some of the cause of time overruns in road construction projects. A study on large construction projects in Vietnam by (Le-Hoai, et al., 2008) identified unforeseen weather conditions, price fluctuations, bad weather conditions and government obstacles as causes of time overruns related to external factors.
Further, studies by (Baldwin & Manthei, 1971) in USA and (Memon, 2014) in Malaysia identified weather and unforeseen ground conditions as a major external factor related causes of time overruns in construction projects.

Mahamid, et al. (2012) identified awarding of contracts to lowest bidders as the major external factor related cause of time overruns in road construction projects in West Bank, while (Shebob, et al., 2012) identified differences in global set up and technological advancements as external related causes of overruns.

Theodore (2009) summarise the external related causes of time overruns in construction projects as follow: subsurface and ground condition effects, delays in permit issuance by government agencies, effects of weather on construction activities, restrictions and traffic control on site, occurrence of accidents during construction, changes in government laws and regulations, service provider delays on utilities and delayed final inspections and certifications.

2.5.3 Effects of Time Overruns in Projects

Pourrostam & Ismail (2011) define effects of construction time overruns as outcomes of not effectively working on the identified causes of time overruns in construction projects.

A study on the effects of time overruns in Libya by (Denini, 2010) identified the following thirteen effects: cost overrun, time overrun, contractual disputes, decrease in financial commitment by owners, claims, acceleration, reduced quality, negative social impacts, reduced safety, litigation, arbitration, contract termination and complete abandonment of the project while further studies on the effects of time overruns in Tanzania identified time overrun, cost overrun, negative social impact, resource idling, disputes, arbitration, delays by clients in repaying loans, poor quality of work due to working in a hurry, delay of the client in getting profits,
bankruptcy, litigation, creation of stress on contractors, total project abandonment and acceleration of losses.

Similar studies in Libya by (Saleh, et al., 2009) revealed that time overruns lead to loss of interest in the project by stakeholders, loss of resources (i.e. money and time), being blacklisted by authorities and reputation declination as effects of time overruns a study by (Sunjka & Jacob, 2013) in Niger Delta identified time overruns, budget overrun, poor quality of completed projects, bad public relations, litigation, arbitration, disputes and claims; and total project abandonment

However, the study will elaborate on the following major effects of time overruns as established by a comprehensive study by (Pourrostam & Ismail, 2011).

2.5.3.1 Time Overruns

Construction projects experience time overruns when the stipulated completion time is pushed forward (Sunjka & Jacob, 2013). Time overruns in projects are due to inclement weather, resource unavailability and delays in design. Vidalis & Najafi (2002) in their study of time overruns in highway projects attributed time overruns to activities in projects which have internal or external cause and effect relationships.

2.5.3.2 Budget Overruns

Sunjka & Jacob (2013) define budget overruns as a situation where project cost at completion is higher than what was budgeted. The degree of budget overruns can be calculated by dividing the difference between the final contract amount and the original contract award amount and then present it as a percentage (Jackson, 1999).

Kikwasi (2012) citing Ramabodu and Verster (2010) established that budget overruns in construction projects are caused by changes in the scope of work on site, issuance of incomplete designs at tender, contractual claim (emanating from
extensions of time with costs), lack/inadequate planning and monitoring tools for project funds, delays in costing variations and additional works as causes of budget overruns. Chileshe & Berko (2010) identified variation orders, inflation and slippages in time as the causes of budget overruns in construction projects.

2.5.3.3 Disputes and Claims

Sunjka & Jacob (2013) established that disputes and claims in construction projects arise from in losses which either the contractor or client may incur due to time overruns. In their final report on the causes on time overruns in construction projects in Florida, (Ahmed, et al., 2002) noted that disputes arise when establishing who caused the time overruns, the magnitude of the overrun and the monetary award or compensation which can be made.

Ahmed, et al. (2002) further states that CPM can be used in addressing the magnitude of time overruns in projects and determining the compensation to be paid.

2.5.3.4 Arbitration

Sobel (1996) define as a form of dispute resolution through the process of going before a neutral person or panel whose identification/selection is agreeable to all parties concerned to hear and determine their dispute. Arbitration has an advantage over the court system through its ability to resolve construction disputes without the need to undertake the long, exasperating and expensive litigation process (Lavigne, 1993).

However, the involvement of professional arbitrators in resolving contractual issues tend to increase overall project costs and duration through the resources and time spent in resolving the disputes (Sunjka & Jacob, 2013).
2.5.3.5 **Litigation**

Hasseb, et al. (2011) define litigation as a process of going to court to have problems resolved which in most cases take a lot of time. Litigation comes into being when large penalties are at stake in construction projects (Sunjka & Jacob, 2013) and is often a result of delayed or non payment for works executed or works being executed and change orders (Hasseb, et al., 2011).

2.5.3.6 **Total Project Abandonment**

In actions towards factors which cause time overruns result in total abandonment of construction projects (Sunjka & Jacob, 2013) while (Hasseb, et al., 2011) define total project abandonment in construction projects as the suspension or stoppage of works for a long period of time. Decisions to abandon projects are mainly arrived at as a result of changes in organisation policy, finances and payments; and natural occurring disasters (Hasseb, et al., 2011).

2.5.4 **Measures for Minimising Time Overruns in Projects**

Successful completion of construction projects brings joy to the project team and the client in particular and the country where the project was implemented stands to benefit economically. Clients suffer financially when time overruns occur in projects (Divya & Ramya, 2015); however recovery of lost income from the contract and minimisation of risks such as time overruns depends on how the contract document was formulated.

Abdelnaser, et al. (2005) in Malaysia established that time overruns in construction projects can be minimised through proper project planning and scheduling of activities while (Aibinu & Jagboro, 2002) in the Nigerian construction industry identified acceleration of project activities and the provision of contingency funds as the main methods of minimising time overruns in construction projects. Studies by
(Nguyen, et al., 2004) in large construction projects in Vietnam established that use of accurate cost estimates, determination of accurate project durations, mobilisation of a competent teams to sites, secure and reliable sources of resources as some of the significant factors that can minimise time overruns in construction projects. Odeh & Battaineh (2002) established that enforcement of liquidated damages clauses on time overruns and giving of incentives for works completed within contract duration can minimise the occurrence of time overruns in construction projects.

Studies by (Abedi, et al., 2012) on major mitigating measures for time overruns in projects identified effective strategic planning, mobilisation of a competent project teams, use of accurate project cost and time estimates, procurement of competent consultants and contractors who have a reputation of executing works to completion, awarding contracts based on capabilities and past experience on the part of contractors, proper project planning of tasks and resources, provision of adequate resources at design stage (money and time), ensuring secure funding for project up to completion, application of contractual clauses (i.e. liquidated damages), comprehensive contractual documentation, holding of progress meetings and timely delivery of materials.

In summarising mitigating measures for time overruns (Assaf, et al., 1995) encouraged clients on the following:

- ensure timely payments for contractors
- minimise issuance of change orders to avoid time overruns
- avoid delays in reviewing and approving design documents; and
- ensure availability of resources and capabilities before contract award

Contractors are encouraged to consider the following factors:
• mobilise an adequate and well motivated labour force

• proper management of financial resources and utilisation of progress payments in cash flow plans; and

• timely mobilisation of administrative and technical staff soon after award to avoid time overruns.

Consultants are encouraged to consider the following points:

• review and approve designs in time,

• flexibility during evaluation of contractors' works

• timely production of design documents; and

• correcting mistakes and discrepancies in design documents before submitting to contractors

Sambasivan & Soon (2007) identified and grouped the following measures to minimise time overruns in construction projects:

(a) client related:

• awarding contracts based experience, technical and financial abilities; and adequate labour force and not lowest evaluated bid

• non interference during implementation and avoidance of design changes

• ensure secure funding for honouring of payment certificates

• provision of quick decisions when the need arises

(b) consultant related:
• avoid discrepancies when drafting contracts

• ensure timely approval of drawings; and

• monitoring of works at appropriate intervals in order to pass proper judgements

(c) contractor related:

• no to engage in works which are outside their expertise

• mobilise a technically sound work force

• seek approvals for work plans from project managers before implementation; and

• secure back up financial resources.
CHAPTER 3: RESEARCH METHODOLOGY AND DESIGN

3.0 CHAPTER INTRODUCTION

This chapter gives the methodology which was used in carrying out this study. The chapter describes the geographical area where the study was carried, the study design and the population sample that was used. The chapter further indicates the instruments which were used in collecting data, methods used to determine causes, effects and measures for minimising overruns in road construction projects in Malawi.

3.1 RATIONALE OF THE RESEARCH

The rationale of this study is to contribute to the body of knowledge on the causes, effects and measures to be used to minimise the occurrence of time overruns in road construction projects in Malawi; and may further act as a springboard for further research in the road construction industry.

3.2 RESEARCH APPROACH AND DESIGN

Research design is defined as “an arrangement of conditions for the collection and analysis of data in a manner that aims to combine relevance to the research with economy in procedure” (Kothari & Garg, 2014). This implies that the research design has to be well thought of as it constitutes the blue print in the collection, measurement and analysis of data.

Research methods are defined as techniques which are used in the collection of data for the research (Saunders, et al., 2009).

This research was based on the research onion as a guide in the formulation of the research stages.
The stages which are followed when using the research onion are as follows:

- philosophies
- strategies
- data collection and analysis

3.2.1 Research Philosophy

This study adopted the positivistic philosophy where there is a belief in the hypothesis based on a social reality and is referred to as the philosophical stance of the natural scientist which assumes that reality is fixed, measured, knowable and that there is one truth. In this positivistic philosophy the researcher is independent from the data and maintains an objective stance of the issues.
(Saunders, et al., 2009) citing Remenyi et al. (1998) explains that in the positivism one works with an observable social reality and that the end product of such a research can be law-like generalisations similar to those produced by physical and natural scientists. In this particular study, “the causes, effects and measures for minimising the occurrence of time overruns in road construction projects” will be established.

3.2.2 Research Strategy

Research strategy is defined as a way of through which a research study can be questioned (Naoum, 1998). Research approaches exist in two categories namely quantitative (an approach which gathers data in order to study relationships; and how the gathered data and studied relationships relate to facts and relationships of previous studies) and qualitative (an approach which endeavours to gain insights into the perceptions of respondents about the world) (Fellows & Liu, 1997). The study adopted the quantitative approach which is descriptive in order to give an accurate account of facts and relationships regarding causes, effects and measures for minimising the occurrence of time overruns in road construction projects (Kikwasi, 2012). Polit & Hungler (1999) narrated that descriptive studies are carried out to observe, describe and to document the natural occurrence of situation aspects.

3.2.3 Research Design

The research comprises seven phases where phase one is about defining the research problem, objectives of the study and outlining the plan which will be used was used for the study. Phase two of the study involved the review of the available literature on the causes, effects and measures for minimising the occurrence of time
overruns in road construction projects. The third phase involved a desk reviews of reports of completed road construction projects.

The fourth phase of the study involved the methodology of the study where the approach used, research technique and sampling, area, population, sample size determination, data collection tools, method of data analysis are presented.

In the fifth phase the data collected is screened and then analysed using the SPSS (Statistical Package for Social Scientists) while the sixth and seventh phases involved discussions, conclusions and recommendations.

3.2.4 Research Time Horizon

The duration of time overruns in road construction projects vary depending on the causes and project type. This study adopted the cross-sectional time horizon since the study is academic hence has time constraints.

3.2.5 Research Techniques and Sampling

This study targeted construction firms, engineers, technical auditors and project financiers who have participated in the construction and rehabilitation roads with RA as part of the population sample.

The study adopted random sampling in selecting respondents from contractors, consulting firms and RA. Kothari & Garg (2014) define random sampling which gives equal chances to all items in a population of being included in a sample.

However selection of respondents from regulatory bodies, RFA and government departments was done purposively which is the selection of certain units of the population based on the specific purpose about the subject matter (Teddlie & Yu, 2007).
3.3 RESEARCH AREA

The study was conducted in three main cities of Blantyre, Lilongwe and Mzuzu Malawi where most of road construction professionals and other professionals involved with the planning, appraisal, construction, monitoring and maintenance of road construction projects are based.

The areas were selected because the researcher is familiar with the road construction projects that have been implemented in these areas recently. This ensured that a representative sample of respondents from the total population was purposively selected.
3.4 RESEARCH POPULATION

The population for the study comprised of technocrats from contracting firms which renewed its membership with NCIC and was in the MKW 500 million and above category. Further the study considered contractors who had executed road construction works with RA valued at MKW 450 million ($650,000.00) in the past five years. Currently the cost of upgrading 1 km stretch of an earth road to the conventional asphalt sealed road is MKW 450 million (Chirambo, 2016).
Technocrats from consulting firms which renewed their membership with NCIC in the 2015/16 financial year and had been actively involved in road construction works in the past five years formed part of the population sample.

Further, the study considered technocrats from RA, RFA, regulatory bodies and government departments for the population sample since they are also involved in road construction works.

3.5 RESEARCH SAMPLE

Sampling is the process where representative units of the population are selected for a research study (Kothari & Garg, 2014). A population sample is proportion of the population which is selected for the purpose of observation and analysis in a research study. The sample for contractors, consultants, clients was randomly selected while that of respondents from RFA, regulatory bodies and government departments was purposively selected.

A statistical formula was used in determining the sample size for the contractors, consultants and clients. The equation below from statistical equation from Creative Research System, 2001, (www.cdb.riken.jp) below was used:

\[ SS = \frac{Z^2 \times P \times (1 - P)}{C^2} \] ............................. equation (1)

where

- \( SS \) : sample size
- \( Z \) : \( Z \) value (i.e. 1.96 for 95% confidence level)
- \( P \) : percentage picking a choice expressed as a decimal
- \( C \) : margin of error

(0.5 used for sample size needed)
The total sample population was 147 comprising of directors, engineers and technicians from clients; the purposively selected respondents from RFA (3), GoM (3), NCIC (3) and others (5).

Using the correction finite population formula below:

\[
SS \text{ (new)} = \frac{SS}{1 + \frac{(SS - 1)}{(Pop)}}
\]

where \(SS\) : sample size

\(Pop\) : sample population

Population samples and questionnaires response rates were calculated and are presented in the table below:

**Table 5: Showing questionnaire responses**

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Organisation</th>
<th>Population</th>
<th>Sample size</th>
<th>Questionnaires Received</th>
<th>Questionnaires Received</th>
<th>Response Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GoM</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>67</td>
</tr>
<tr>
<td>2</td>
<td>RA</td>
<td>41</td>
<td>31</td>
<td>31</td>
<td>26</td>
<td>84</td>
</tr>
<tr>
<td>3</td>
<td>RFA</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>33</td>
</tr>
<tr>
<td>4</td>
<td>NCIC</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>67</td>
</tr>
<tr>
<td>5</td>
<td>Contractors</td>
<td>44</td>
<td>32</td>
<td>32</td>
<td>22</td>
<td>69</td>
</tr>
<tr>
<td>6</td>
<td>Consultants</td>
<td>48</td>
<td>34</td>
<td>34</td>
<td>30</td>
<td>88</td>
</tr>
<tr>
<td>7</td>
<td>Others</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>60</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>147</strong></td>
<td><strong>111</strong></td>
<td><strong>111</strong></td>
<td><strong>86</strong></td>
<td><strong>77</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Source: Author (2016)*

3.6 **DESK REVIEW**

The study conducted a desk review of the available literature of documents related to the road construction projects like project completion reports, provisional acceptance reports and other related documents in order to ascertain the causes, effects and measures which can be employed to minimise the occurrence of time overruns in
road construction projects in Malawi. The reviewed documentation from completed projects comprised draft reports, final acceptance reports and project completion reports for the following road projects:

- NCIC List of Registered Contractors for the 2015/2016 Financial Year
- Provisional Acceptance Report for the Multinational Nacala Road Corridor Phase 1 Project: Lilongwe Western By Pass – November, 2014
- Project Completion Report: Mchinji – Kasungu - Msulira Road Project – October, 2005
- Final Report : Lumbadzi – Dowa – Chezi Road Project: March, 201

3.7 USE OF QUESTIONNAIRES

A well structured questionnaire was used to collect data and it was divided into five major sections.

Saunders, et al. (2009) citing (de Vaus, 2002) define a questionnaire as a technique for collecting data where people respond to the same set of questions in a pre-determined order; and information therein is similar to that obtained through interviews though it lacks depth (Kothari & Garg, 2014). Data from questionnaires is quantified easily and quickly whilst its analysis is more objective and scientific than other forms of research.
3.8 RESPONDENTS’ TO THE SURVEY

Respondents to the survey were technocrats in the road construction industry comprising of engineers, technicians, auditors, from government departments, RA, RFA, Consultants, Contractors and other who are pursuing further studies but are practitioners.

3.9 DATA COLLECTION EQUIPMENT

Self-administered questionnaires were used for collecting data for the research.

The questionnaire had five (5) sections namely A, B, C, D and E. Section A of the questionnaire was aimed at collecting background information of the respondents such as their employer, position; whereas section B was aimed at collecting data related to the technical experiences of the respondents in the form of years of experience, number of projects worked on and the proportion of projects completed outside time and the length of the time overrun. Section C of questionnaire was aimed at determining the causes of time overruns in road construction projects where as section D and E explored the effects of time overruns and methods of minimising overruns in road construction projects respectively.

3.10 DATA COLLECTION

A list of potential respondents was generated once the questionnaire was approved. Questionnaires were distributed to the respondents in two ways namely: e-mails and hand delivery. Upon completion of the questionnaires, respondents e-mailed back the questionnaires to researcher, whilst others hand delivered them to the researcher and the rest were physically collected from the respondents by the researcher.
3.11 DATA COLLECTION PERIOD

Data for the research was collected in a four (4) week period and respondents were not in any way coerced to fill the questionnaire, and on average it required about twenty minutes to complete the questionnaire. Of the 111 questionnaires which were circulated, a total of 86 responsive questionnaires were returned representing a 77% response rate.

3.12 RANKED DATA

Respondents to the study were requested to rank the causes, effects and measures for minimising time overruns in road construction projects from 1 – 5 (where 5 represented a strong cause, effect or measure while 1 represented weaker cause, effect or measure). This type of rating is called ordered categorical (Coe, 2007) and statistical package for social scientists (SPSS) version 20 was used to analyse the data.

3.13 ETHICAL CONSIDERATION

The researcher assured participants in the research that use of their input was confidential was to be used for the academic purposes only. Further the research acknowledged and cited contributions from professional which were used in the literature for the study.

In line with the ethical considerations for carrying a research with University of Bolton, a cover letter permitting the researcher to carry out the research from Malawi Institute of Management (MIM), a request to carry out the research within RA, and the permission were attached to the questionnaires which were sent out.
3.14 DATA ANALYSIS

The data which was collected from the respondents through questionnaires was cleaned to detect and correct errors and then screened to check for its accuracy before being analysed. Raw data was screened and cleaned before being entered into SPSS version 20 for analysis of frequencies.

Frequencies and percentages of the responses were used in the presentation of data in the form of bar graphs, pie charts and tables.

Results from the analysed data were used in the discovery of new information about time overruns in road construction projects, suggesting solutions and making recommendations which can mitigate time overruns in road construction projects.

3.15 CONSISTENCY

Cronbach’s Alpha was used to measure the internal consistency of the closely related items in the research data. The results from the consistency test on the causes, effects and measures for minimising time overruns are presented in the table below.
Table 6: Cronbach’s Tests Consistency Results

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Category of Results</th>
<th>Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Client related causes of time overruns</td>
<td>0.886</td>
</tr>
<tr>
<td>2</td>
<td>Consultant related causes of time overruns</td>
<td>0.837</td>
</tr>
<tr>
<td>3</td>
<td>Equipment related causes of time overruns</td>
<td>0.794</td>
</tr>
<tr>
<td>4</td>
<td>Health and Safety related causes of time overruns</td>
<td>0.731</td>
</tr>
<tr>
<td>5</td>
<td>Labour related causes of time overruns</td>
<td>0.791</td>
</tr>
<tr>
<td>6</td>
<td>External related causes of time overruns</td>
<td>0.756</td>
</tr>
<tr>
<td>7</td>
<td>Contractor related causes of time overruns</td>
<td>0.823</td>
</tr>
<tr>
<td>8</td>
<td>Material related causes of time overruns</td>
<td>0.743</td>
</tr>
<tr>
<td>9</td>
<td>Effects of time overruns</td>
<td>0.841</td>
</tr>
<tr>
<td>10</td>
<td>Measures for minimising time overruns</td>
<td>0.813</td>
</tr>
</tbody>
</table>

*Source: Author (2012)*

The consistency results by Cronbach’s test of the study were above 0.7 which according to (George & Mallery, 2003) are considered acceptable.

3.15 LIMITATIONS OF THE STUDY

The study focussed on technocrats who are involved with the construction of roads from contractors, consulting firms, key public institutions and co-operating partners within Malawi.

However, this had the potential of leaving out some experienced technocrats who had already finished their assignments in the country and have since relocated to other places across the globe but have vital information on the causes, effects and
measures to be employed in minimising the occurrence of time overruns in road construction projects.
CHAPTER 4: DATA COLLECTION AND ANALYSIS

4.0 CHAPTER INTRODUCTION

The chapter presents the processes which were used for data collection and the methods for analysis. A well-structured questionnaire was sent out to respondents through e-mails and hand delivery.

Data analysis and interpretation of the results from the questionnaire presented the basis for this quantitative questionnaire which led to the conclusions, recommendations and reporting of the study.

4.1 REVIEW OF REPORTS ON COMPLETED ROAD PROJECTS

A review of the project documents listed above revealed that time overruns were experienced in all the projects *(See Table 7).*

Causes of the time overruns in the projects selected are reviewed in the following sections.

4.1.1 Time Overruns on the Mzimba - Eswazini - Mzalangwe Road Project

A review of the PCR for the Mzimba – Eswazini - Mzalangwe road project revealed that the project experienced time overruns of 24 months. The works on the contract were scheduled for completion within a period of 68 months.

The total value of works at project closure was MKW 8,643,497,222.85 implying that project had cost overruns amounting to MKW 1,516,523,120.50.

Time overruns experienced during the project implementation were attributed to the following factors:

- delays completion of designs for the road and associated structures
Table 7: Project Details on Contract Durations and Budgets

<table>
<thead>
<tr>
<th>No.</th>
<th>Project Name and Description</th>
<th>Contractor</th>
<th>Source of Funding</th>
<th>Length (km)</th>
<th>Start Date</th>
<th>Original Completion Date</th>
<th>Revised Completion Date</th>
<th>Period of Time Overrun</th>
<th>Initial Contract Amount</th>
<th>Revised Contract Amount</th>
<th>Revised Contract Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mzimba - Mzalangwe Road Upgrading from Earth to Bitumen Standard Class 2</td>
<td>Fargo</td>
<td>GoM</td>
<td>62</td>
<td>1-May-09</td>
<td>31-Dec-12</td>
<td>31-Dec-14</td>
<td>24 months</td>
<td>7,126,974,102.35</td>
<td>8,643,497,222.85</td>
<td>1,516,523,120.50</td>
</tr>
<tr>
<td>2</td>
<td>Lumbadzi - Dowa - Chezi Road Upgrading from Earth to Bitumen Standard Class 1+ Namitete Hospital Road Upgrading from Earth to Low Volume Sealed Road</td>
<td>Cilcon</td>
<td>GoM</td>
<td>39</td>
<td>1-Jul-08</td>
<td>1-Jul-11</td>
<td>30-Jun-14</td>
<td>36 months</td>
<td>3,131,443,588.90</td>
<td>5,156,693,977.46</td>
<td>2,025,250,388.56</td>
</tr>
<tr>
<td>3</td>
<td>Chikwawa - Nchalo - Bangula Road: Ngabu - Bangula Section Periodic Maintenance and Rehabilitation</td>
<td>Mota-Engil</td>
<td>GoM</td>
<td>35</td>
<td>3-Sep-12</td>
<td>2-Sep-14</td>
<td>2-Dec-14</td>
<td>3 months</td>
<td>26,361,193,594.60</td>
<td>26,361,193,594.60</td>
<td>0.00</td>
</tr>
<tr>
<td>4</td>
<td>Chikhwawa - Bangula road: Chikwawa - Ngabu Section Periodic Maintenance and Rehabilitation</td>
<td>Mota-Engil</td>
<td>EU</td>
<td>46</td>
<td>24-Nov-08</td>
<td>23-Nov-10</td>
<td>4-Aug-12</td>
<td>19 months</td>
<td>11,264,480,591.00</td>
<td>11,264,480,591.00</td>
<td>0.00</td>
</tr>
<tr>
<td>5</td>
<td>Lilongwe City West Bypass New Construction to Bitumen Standard Class 1 Road</td>
<td>Mota Engil</td>
<td>AfDB &amp; GoM</td>
<td>13.4</td>
<td>19-Nov-12</td>
<td>19-May-14</td>
<td>12-Nov-14</td>
<td>6 months</td>
<td>4,141,023,383.00</td>
<td>4,141,023,383.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

*Source: RA Construction Department Quarterly Report as at 31st December, 2015 – (Confidential Information)*
- delays in effecting payment to the contractor for completed civil works

The contractors’ prolonged stay on site beyond the contract period resulted in the work payment rates used at bidding being no longer profitable; and the clients’ denial to effect escalations resulted into stand with the contractor which in the project closure.

4.1.2 Causes of Time Overruns on Lumbadzi – Dowa – Chezi Road Project

The works on this project were scheduled for completion in a period of 36 months but the works were completed 36 months after the expiry of the initial contract period.

At project completion, the value of the completed civil works had exceeded the initial contract budget of MKW 3,131,443,588.90 budget by MKW 2,025,256,388.56 representing a 65% budget overrun.

The time overruns experienced on the project were attributed to the following factors:

- scope changes by clients which resulted in the addition of the construction of the road to Namitete Hospital (a distance of 70 km from the original project site)
- delays in effecting payment to the contractor for completed civil works

The works on the contract were completed successfully completed and the road is operational.

4.1.3 Causes of Time Overruns on the Chikwawa – Nchalo – Bangula Road Project: Ngabu – Bangula Section

The works on this project were scheduled for completion in a period of 24 months but required an additional 3 months to ensure successful completion of the works. The
works on this contract did not experience any cost overruns and were completed within the initial budget of MKW 26,361,193,594.60.

The time overruns experienced on the project were attributed to the following factors:

- design changes during construction stage i.e. the construction of bridge foundations and approaches at Mtayamoyo Bailey Bridge at Chiromo.
- delays in effecting payment to the contractor for completed civil works

Despite the highlighted causes of time overruns, the works on the contract were completed on in July, 2012 and the road operational now.

4.1.4 Causes of Time Overruns on the Chikwawa – Nchalo – Bangula Road Project: Chikwawa – Nchalo – Ngabu Section

The works on this project were scheduled for completion in a period of 24 months but were completed 20 months after the expiry of the initial contract period. However, despite the project experiencing time overruns, the works were completed within the initial budget of MKW 11,264,480,591.00.

The time overruns experienced on the project were attributed to the following factors:

- design changes during construction which were effected to raise the road to counter the effects of floods in low lying areas
- fuel shortages which were experienced in Malawi during the period March, 2011 and April, 2012
- lack of qualified personnel on the part of the contractor

Despite the highlighted causes of time overruns, the works on the contract were completed on in July, 2012 and the road operational now.
4.1.5 Causes of Time Overruns on the Lilongwe City West Bypass

The works on his contract were due for completion in a period of 18 months but the works were completed approximately 6 months after the expiry of the initial contract period. Despite the time overrun, the works were completed within the planned initial budget of MKW 4,141,023,383.09. The works on the contract were completed and the road in question is operational.

Time overruns experienced on this project were attributed to the following factors:

- adverse climatic conditions
- scope changes due to additional works to construct raised footpaths on shoulders; and
- delayed relocation of services

The works on the road in question were completed and it is now operational.

4.1.6 Lessons Learnt

Review of the project reports established the following:

- GoM funded projects are effected without securing reliable funding hence delays in effecting payments
- road projects funded by GoM experience major scope changes which cause major time and budget overruns (i.e. additional works to construct road approaches and foundations for Mtayamoyo at Bangula)
- road project are effected when designs are not complete

4.2 ANALYSIS OF QUANTITATIVE DATA

Results of suggested factors from respondents were analysed as a whole with an aim of removing bias which could have emanated from one respondent blaming the other
depending on the experience they had on site. Of the 111 questionnaires sent out, 86 were returned representing a 77% responsive rate.

Frequencies were used to rank factors depending on the frequency level as determined by the respondents. However, it should be noted that in ranked data, the numbers assigned to the reasons by respondents are arbitrary since the difference or ratio between any two types of rankings is not the same along the scale (LeBlanc III, 1993).

4.2.1 Background Information Results

4.2.1.1 Current Employer of Respondent

An analysis of the responsive questionnaires indicated that 35% of the respondents were from consulting firms, 30.2% of the respondents were from RA, whilst 25.6% of the respondents were from contractors. 3.5% of the respondents comprised of technocrats who have been involved in the road construction industry but are currently pursuing further studies and another who is engaged in agri-business. Further 2.3% of respondents were from government and NCIC respectively. RFA had the least respondents to the questionnaire with only a 1.2% responsive rate.
Figure III: Respondents’ Organisation

<table>
<thead>
<tr>
<th>Respondents' Organisationst Title</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government</td>
<td>2%</td>
</tr>
<tr>
<td>Roads Authority</td>
<td>30%</td>
</tr>
<tr>
<td>Roads Fund Administration</td>
<td>1%</td>
</tr>
<tr>
<td>National Construction Industry Council of Malawi</td>
<td>2%</td>
</tr>
<tr>
<td>Consultant</td>
<td>35%</td>
</tr>
<tr>
<td>Contractor</td>
<td>26%</td>
</tr>
<tr>
<td>Others</td>
<td>4%</td>
</tr>
<tr>
<td>Consultant</td>
<td>35%</td>
</tr>
<tr>
<td>Contractor</td>
<td>26%</td>
</tr>
<tr>
<td>Others</td>
<td>4%</td>
</tr>
</tbody>
</table>

Source: Author (2016)

4.2.1.2 Positions in Organisations/Companies

Regarding positions of respective respondents in organisations/companies, the analysis revealed that 16.3% of the respondents were engineers from client organisations and consultants respectively, while 14% of the respondents were technicians from client organisations, 9.31% of the respondents were directors of construction companies; while 8.1% were directors of consulting firms and engineers from contractors respectively. The analysis further indicated that 7.0% of the respondents were directors/section heads from client organisations, whilst 5.8% of the respondents were site agents for the contractors and technicians from the client organisations respectively. Further the analysis revealed that 4.7% of the respondents were technicians from contractors with 3.5% being resident engineers from consultants and 1.2% of the respondents being technical auditors.
Figure IV: Respondents’ Positions

4.2.2 Technical Experience of Respondents

4.2.2.1 Number of Years in the Road Construction Industry

Results pertaining to the numbers of years the respondents have been in the industry revealed that 30.2% of respondents have been in the industry for a period of between 16 – 20 years, 25.6% have been in the industry for a period of 11 – 15 while 23.3% of the respondents have been in the industry for a period of 6-10 years. Further analysis revealed that 12.8% of the respondents have been in the industry for a period of 21 years and beyond while the remaining 8.1% of the respondent have been in the industry for a period of 1 – 5 years.
Figure V: No. of Respondents’ Years in the Road Construction Industry

![Bar Chart: No. of Years in Road Construction Industry]

Source: Author (2016)

4.2.2.2 Road Construction Projects Involved In

An analysis of the road construction projects the respondents have been involved in revealed that 80.2% of the respondents have been involved in more than 8 road construction projects, while 9.3% or the respondents were involved in 3 – 4 projects, 5.8% of the respondents were involved in 1 - 2 projects whilst 4.7% of the respondents were involved in 5 - 6 projects and only 1.2% of the respondents was involved in 7-8 road construction projects.
4.2.2.3 Proportion of Project Completed Outside Time

Findings relating to road construction projects being completed outside time indicated that 40.7% of the respondents had seen 1 – 25% being completed outside duration, while 22.1% of the respondents had seen 26 - 50% of the projects completed outside their durations, 19.8% had seen 51 – 75% of the projects completed outside their duration while 14% of respondents had seen 76 – 100% of the projects they were involved in completed outside time.
Analysed results of projects completion duration indicated that 27.9% of the respondents had seen 51 – 75% of road project they were involved in completed on time, while 25.6% of the respondents had seen 76 – 100% of projects they were involved in completed on time, while 20.9% of respondents had seen 26 – 50% projects completed on time, 19.8% had seen 1 -25% of their projects completed within their durations. However, 5.8% of respondents had never seen a project completed within its stipulated duration.
Figure VIII: No. of projects completed within duration

![Bar chart showing the percentage of projects completed within different duration ranges.](image)

- 76 - 100%: 25.6%
- 51 - 75%: 27.9%
- 36 - 50%: 20.9%
- 1 - 25%: 19.8%
- 0%: 5.8%

Source: Author (2016)

4.2.2.5 Period of Overruns Experienced

An analysis of time overrun periods experienced by the respondents in road construction projects revealed that 67.4% of the respondents had experienced time overruns in projects in the range of 1 – 6 months, while 16.3% of the respondents experienced overruns in the range of 7 – 12 months, 9.3% of the respondents experienced overruns in the range of 13 – 18 months. Further the analysis revealed that 3.5% of respondents have never experienced any overruns in road construction projects while 1.2% of the respondents indicated that they have experienced time overruns in the ranges of 19 – 24 months and 25 – 30 months respectively, while none of the respondents had experienced overruns in the range of 30 – 36 months.
4.2.3 Analysed Results of Time Overrun Causes in Road Projects

The research data was further analysed using the SPSS software to determine dominant causes of time overruns in road construction projects in Malawi. The analysed results are presented in the following sections:

4.2.3.1 Client/Owner Related Causes of Time Overruns in Road Projects

An analysis of the ranked client/owner related cause of time overrun in road construction projects being implemented by RA in Malawi revealed inadequate planning was ranked as first (81.4%), seconded by delays in processing payments for contractors (76.7%). Slow decision making processes by RA staff with 67.4% was ranked as the third cause of time overruns in road construction projects followed by design changes by clients during construction (57%) and delays in revising and approving design documents (53.5%). Poor coordination during project implementation (44.2%) was ranked sixth while poor communication between client and the construction team was seventh (38.4%). Delays in approving construction
drawings (22.1%) was ranked as the eighth cause of time overruns related to clients followed by suspension of works by clients (12.8%) on ninth and delays in approving material samples (9.3%) on tenth. Delays in settling compensation payments by the client (5.8%) was another reason which respondents singled out as another cause of time overruns in road construction projects in Malawi. Below is a summarised table of the client/owner related causes of time overruns in road construction projects in Malawi.

Table 8: Ranking of Client Related Causes of Time Overruns

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Client/Owner Related Causes of Time Overruns in Road Projects in Malawi</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Inadequate Planning</td>
<td>81.4</td>
</tr>
<tr>
<td>2</td>
<td>Delays in processing contractors’ payments</td>
<td>76.7</td>
</tr>
<tr>
<td>3</td>
<td>Slow decision making processes</td>
<td>67.4</td>
</tr>
<tr>
<td>4</td>
<td>Design changes by Clients during construction</td>
<td>57.0</td>
</tr>
<tr>
<td>5</td>
<td>Delays in revising and approving design documents</td>
<td>53.5</td>
</tr>
<tr>
<td>6</td>
<td>Poor coordination during project implementation</td>
<td>44.2</td>
</tr>
<tr>
<td>7</td>
<td>Poor communication between the client and the construction team</td>
<td>38.4</td>
</tr>
<tr>
<td>8</td>
<td>Delays in approving drawings</td>
<td>22.1</td>
</tr>
<tr>
<td>9</td>
<td>Suspension of works by clients</td>
<td>12.8</td>
</tr>
<tr>
<td>10</td>
<td>Delays in approving samples</td>
<td>9.3</td>
</tr>
<tr>
<td>11</td>
<td>Other</td>
<td>5.8</td>
</tr>
</tbody>
</table>

Source: Author (2016)

4.2.3.2 Consultant Related Causes of Time Overruns in Road Projects

Analysed results of the consultant related causes of time overruns in road construction project in Malawi revealed that delays in approving major changes in the scope of works (67.4%) as the major cause, seconded by delays in certifying contractors’
payments (59.3%). Inadequate experience of consultants' staff (57.0%) was ranked the third major cause of delays in road projects related to consultants followed by insufficient data collection and surveys before designs (53.5%) and mistakes and inconsistencies in design documents (53.5%) of fourth position; and unclear and inadequate details in design drawings (45.3%) being ranked fifth. Consultants' delays in producing design documents (38.4%) was ranked as the sixth cause of time overruns followed by their lack of advanced engineering software on seventh (33.7%) and poor coordination on eighth position. Poor communication (22.1%) was ranked as the ninth cause of time overruns while others (3.5%) with reasons like stoppage of works due to failure to follow instructions was ranked tenth. Below is a summarised table of the ranked percentages of consultant related causes of time overruns in road construction projects.

**Table 9: Ranking of Consultant Related Causes of Time Overruns**

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Consultant Related Causes of Time Overruns in Road Projects in Malawi</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Delayed approvals for major changes in the scope of works</td>
<td>67.4</td>
</tr>
<tr>
<td>2</td>
<td>Delays in certifying contractors' payment certificates</td>
<td>59.3</td>
</tr>
<tr>
<td>3</td>
<td>Inadequate experience of consultants' staff</td>
<td>57.0</td>
</tr>
<tr>
<td>4</td>
<td>Insufficient data collection and surveys before designs</td>
<td>53.5</td>
</tr>
<tr>
<td>5</td>
<td>Mistakes and inconsistencies in design documents</td>
<td>53.5</td>
</tr>
<tr>
<td>6</td>
<td>Unclear and inadequate details in design drawings</td>
<td>45.3</td>
</tr>
<tr>
<td>7</td>
<td>Delays in producing design documents</td>
<td>38.4</td>
</tr>
<tr>
<td>8</td>
<td>Lack of advanced engineering software</td>
<td>33.7</td>
</tr>
<tr>
<td>9</td>
<td>Poor coordination</td>
<td>30.2</td>
</tr>
<tr>
<td>10</td>
<td>Poor communication</td>
<td>22.1</td>
</tr>
<tr>
<td>11</td>
<td>Other</td>
<td>3.5</td>
</tr>
</tbody>
</table>

*Source: Author (2016)*
4.2.3.3 Contractor Related Causes of Time Overruns in Road Projects

Regarding, the causes of time overruns related to Contractors in road construction projects; contractors’ inadequate financial capacity (89.5%) was ranked first followed by delays in mobilising to project site (75.6%) on second and poor planning and scheduling of project activities (64%) ranked third. Poor qualifications for the contractors’ staff (43%) was ranked the fourth cause of time overruns related to contractors followed by re-works due to construction errors (37.2%) on fifth position followed by in experience on the part of contractors’ staff (36.0%) of sixth position and poor coordination of project activities during implementation (33.6%) on seventh position. In addition conflicts between contractors and the collaborating partners (24.4%) was ranked eighth; with poor/proper construction methods (23.3%) ranked ninth followed by inadequate experience on the part of the contractor (16.3%) on tenth position.

Further analysis of the causes of time overruns in road construction projects related to contractors ranked poor communication (14%) eleventh; followed by poor method statements (11.6%) on twelfth; and delays by sub-contractors in executing works (5.8%) on thirteenth. However, the respondents indicated that other causes related to contractors included offering low wages and harsh treatment of workers (3.5%) were ranked fourteenth on the cause of time overruns in road construction projects followed by conflicts in time of sub-contractors during implementation(2.3%) and frequent changes in the engagement of sub-contractors (2.3%) at fifteenth.
Table 10: Ranking of Consultant Related Causes of Time Overruns

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Contractor Related Causes of Time Delays in Road Construction Projects</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Inadequate financial capacity to finance projects</td>
<td>77.9</td>
</tr>
<tr>
<td>2</td>
<td>Delays in mobilising to project sites</td>
<td>75.6</td>
</tr>
<tr>
<td>3</td>
<td>Poor planning and scheduling of project activities</td>
<td>64.0</td>
</tr>
<tr>
<td>4</td>
<td>Poor qualifications of contractors staff</td>
<td>43.0</td>
</tr>
<tr>
<td>5</td>
<td>Re-works due to construction errors</td>
<td>37.2</td>
</tr>
<tr>
<td>6</td>
<td>Inadequate experience on the part of contractors’ staff</td>
<td>36.0</td>
</tr>
<tr>
<td>7</td>
<td>Poor coordination of project activities during implementation</td>
<td>32.6</td>
</tr>
<tr>
<td>8</td>
<td>Conflicts between contractors and collaborating partners(i.e consultant and client)</td>
<td>24.4</td>
</tr>
<tr>
<td>9</td>
<td>Poor/improper construction methods</td>
<td>23.3</td>
</tr>
<tr>
<td>10</td>
<td>Inadequate experience on the part of the contractor</td>
<td>16.3</td>
</tr>
<tr>
<td>11</td>
<td>Poor communication</td>
<td>14.0</td>
</tr>
<tr>
<td>12</td>
<td>Poor method statements</td>
<td>11.6</td>
</tr>
<tr>
<td>13</td>
<td>Delays by sub-contractors in executing works</td>
<td>5.8</td>
</tr>
<tr>
<td>14</td>
<td>Other</td>
<td>3.5</td>
</tr>
<tr>
<td>15</td>
<td>Conflicts in schedule of sub-contractors during project execution</td>
<td>2.3</td>
</tr>
<tr>
<td>15</td>
<td>Frequent changes in the engagement of sub-contractors</td>
<td>2.3</td>
</tr>
</tbody>
</table>

*Source: Author (2016)*

**4.2.3.4 Equipment Related Causes of Time Overruns in Road Projects**

An analysis of the causes of time overruns related to equipment in road construction project in Malawi ranked the unavailability of equipment (59.3%) first in causing time overruns followed by the breakdown of equipment (54.7%) on second position; and the unavailability of skilled equipment operators (47.7%) on third and lack of high-technology mechanical equipment (45.3%) on fourth position.
Further analysis on the causes of time overruns related to equipment ranked ineffective and low productivity of equipment (41.9%) on fifth position followed by use of obsolete equipment on (40.7%) on sixth and use of wrong equipment (31.4%) being ranked seventh. The least ranked factor on position eight was other reasons (10.5%) comprising of factors like unavailability of spare parts.

Table 11: Ranking of Labour Related Causes of Time Overruns

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Equipment Related Causes of Time Overruns in Road Construction Projects</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Unavailability of equipment</td>
<td>59.3</td>
</tr>
<tr>
<td>2</td>
<td>Breakdown of equipment</td>
<td>54.7</td>
</tr>
<tr>
<td>3</td>
<td>Unavailability of skilled equipment operators</td>
<td>47.7</td>
</tr>
<tr>
<td>4</td>
<td>Lack if high-technology mechanical equipment</td>
<td>45.3</td>
</tr>
<tr>
<td>5</td>
<td>Ineffective and low productivity of equipment</td>
<td>41.9</td>
</tr>
<tr>
<td>6</td>
<td>Use of obsolete equipment</td>
<td>40.7</td>
</tr>
<tr>
<td>7</td>
<td>Usage of wrong equipment</td>
<td>31.4</td>
</tr>
<tr>
<td>8</td>
<td>Other</td>
<td>10.5</td>
</tr>
</tbody>
</table>

Source: Author (2016)

4.2.3.5 Material Related Causes of Time Overruns in Road Projects

Results from the analysis of materials related causes of time overruns ranked the fluctuation of material prices (62.8.0%) first followed by delays in ordering project materials (36.0%) on the second; and delays in delivering project materials (34.9%) being ranked third. Further analysis of time overruns related to materials ranked unavailability of specified construction materials on local markets (33.7%) on the fourth position while delivery of sub-standard materials to project sites (31.4%) was ranked fifth followed by material type change during construction (30.2%) on sixth position and poor storage facilities for project materials leading to loss of required
properties, quality and consequent damage (26.7%) on seventh position. Unavailability of improved materials on the local markets (25.6%) was ranked eighth whilst the ordering of wrong materials (10.5%) and the delivery of wrong materials (9.3%) ranked tenth. Damages to sorted materials whilst needed on site (4.7%) and other reasons comprising of delays in paying for borrow pits (4.7%) were ranked eleventh on the causes of time overruns in road construction projects. The table below present the analysis results.

Table 12: Ranking of Material Related Causes of Time Overruns

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Material Related Causes of Time Overruns in Road Construction Projects in Malawi</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fluctuation of material prices</td>
<td>62.8</td>
</tr>
<tr>
<td>2</td>
<td>Delays in ordering project materials</td>
<td>36.0</td>
</tr>
<tr>
<td>3</td>
<td>Delays in delivering project materials</td>
<td>34.9</td>
</tr>
<tr>
<td>4</td>
<td>Unavailability of specified construction materials on local markets</td>
<td>33.7</td>
</tr>
<tr>
<td>5</td>
<td>Delivery of sub-standard materials to project sites</td>
<td>31.4</td>
</tr>
<tr>
<td>6</td>
<td>Material type change during construction</td>
<td>30.2</td>
</tr>
<tr>
<td>7</td>
<td>Poor storage facilities for project materials leading to loss of required properties, quality and consequent damage</td>
<td>26.7</td>
</tr>
<tr>
<td>8</td>
<td>Unavailability of improved materials on the local markets</td>
<td>25.6</td>
</tr>
<tr>
<td>9</td>
<td>Ordering of wrong materials</td>
<td>10.5</td>
</tr>
<tr>
<td>10</td>
<td>Delivery of wrong materials</td>
<td>9.3</td>
</tr>
<tr>
<td>11</td>
<td>Damages to sorted materials whilst needed most on site</td>
<td>4.7</td>
</tr>
<tr>
<td>11</td>
<td>Other</td>
<td>4.7</td>
</tr>
</tbody>
</table>

*Source: Author (2016)*
4.2.3.6 Labour Related Causes of Time Overruns in Road Projects

Analysed results from the labour related causes of time overruns in road construction projects ranked the unavailability of (58.1%) first followed by low production levels in the labour force (50.0%) on second and attitude of workers towards work (47.7%) on third. Further analysis of the labour related factors ranked insecurity of workers leading to not passing on related work experience to others (44.2%) on fourth position followed by inexperience on the part of workers (39.5%) on fifth and conflict amongst workers (27.9%) on sixth position. Delays in the issuance of work permits to foreign experts (18.6%) was ranked seventh other reasons (17.4%) comprising of non sharing of project goals, non issuance of incentives on achieved milestones and language problems was ranked eighth. Below are the summarised results of the labour related time overruns in road construction projects.

Table 13: Ranking of Labour Related Causes of Time Overruns

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Labour Related Causes of Time Overruns in Road Construction Projects in Malawi</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Unavailability of qualified workforce</td>
<td>58.1</td>
</tr>
<tr>
<td>2</td>
<td>Low production levels in the labour force</td>
<td>50.0</td>
</tr>
<tr>
<td>2</td>
<td>Attitude of workers towards works</td>
<td>47.7</td>
</tr>
<tr>
<td>4</td>
<td>Insecurity leading to not passing on related work experience to others</td>
<td>44.2</td>
</tr>
<tr>
<td>5</td>
<td>Inexperience on the part of the workers</td>
<td>39.5</td>
</tr>
<tr>
<td>6</td>
<td>Conflicts amongst workers</td>
<td>27.9</td>
</tr>
<tr>
<td>7</td>
<td>Delays in the issuance of work permits to foreign experts</td>
<td>18.6</td>
</tr>
<tr>
<td>8</td>
<td>Other</td>
<td>17.4</td>
</tr>
</tbody>
</table>

Source: Author (2016)
4.2.3.7 Health and Safety Related Causes of Time Overruns in Road Projects

An analysis of the health and safety factors that causes time overruns in road construction project in Malawi ranked workers risky behaviour (66.3%) as the most predominant factor causing time overruns followed by the stoppage of work due to negligence in observing health and safety during project implementation (50.0%) on second and accidents during road construction works (47.7%) and inadequate safety officers (47.7%) on third position respectively. Further analysis of the health and safety factors that cause time overruns in road construction projects ranked failure to use safety equipment during road construction (46.5%) on fifth position followed by the use of inappropriate equipment (38.4%) on sixth position. Death of skilled workers during road construction (34.9%) was ranked seventh followed by workers working in unsafe areas (24.4%) on eighth position. The least ranked cause related to health and safety was other (8.1%) which comprised of factors like negligence by contractors on health and safety issues when executing works being ranked ninth. The table below gives the summary of the health and safety related factors and their ranking.
Table 14: Ranking of Health and Safety Related Causes of Time Overruns

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Health and Safety Related Causes of Time Overruns in Road Construction Projects in Malawi</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Workers risky behaviour</td>
<td>66.3</td>
</tr>
<tr>
<td>2</td>
<td>Stoppage of works due to negligence in observing health and safety</td>
<td>50.0</td>
</tr>
<tr>
<td>3</td>
<td>Accidents during road construction</td>
<td>47.7</td>
</tr>
<tr>
<td>3</td>
<td>Inadequate safety officers on site</td>
<td>47.7</td>
</tr>
<tr>
<td>5</td>
<td>Failure to use safety equipment during road construction</td>
<td>46.5</td>
</tr>
<tr>
<td>6</td>
<td>Use of inappropriate equipment</td>
<td>38.4</td>
</tr>
<tr>
<td>7</td>
<td>Death of skilled workers during road construction</td>
<td>34.9</td>
</tr>
<tr>
<td>8</td>
<td>Working in unsafe areas</td>
<td>24.4</td>
</tr>
<tr>
<td>9</td>
<td>Other</td>
<td>8.1</td>
</tr>
</tbody>
</table>

Source: Author (2016)

4.2.3.8 External Factor Related Causes of Time Overruns in Road Projects

Results of the analysed external causes of time overruns in road construction projects ranked political interference (61.6%) first followed by effects of weather on road construction works (59.3%) on second; delays in the provision of services by utility companies (52.3%) on third and criminal activities (47.7%) on fourth position. Further analysis of time overruns related to external factors ranked effects of subsurface and ground conditions (38.4%) on fifth followed by natural disasters (37.2) on sixth position and delays in obtaining work permits (36.0%) and certification and undertaking final inspections (36.0%) being ranked seventh respectively. Control of traffic and other restrictions on site (12.8%) was ranked ninth followed by changes in government regulations (11.6%) on tenth position and others comprising of delays in removing
services from road reserve, importation of labour and delayed compensations (8.1%) was ranked eleventh.

Table 15: Ranking of External Factor Related Causes of Time Overruns

<table>
<thead>
<tr>
<th>Ranking</th>
<th>External Factor Related Causes of Time Overruns in Road Construction Projects in Malawi</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Political interference</td>
<td>61.6</td>
</tr>
<tr>
<td>2</td>
<td>Effects of weather on road construction works</td>
<td>59.3</td>
</tr>
<tr>
<td>3</td>
<td>Delays in the provision of services by utility organisations</td>
<td>52.3</td>
</tr>
<tr>
<td>4</td>
<td>Criminal activities</td>
<td>47.7</td>
</tr>
<tr>
<td>5</td>
<td>Effects of sub-surface and ground conditions</td>
<td>38.4</td>
</tr>
<tr>
<td>6</td>
<td>Natural disasters</td>
<td>37.2</td>
</tr>
<tr>
<td>7</td>
<td>Delays in obtaining permits from authorities</td>
<td>36.0</td>
</tr>
<tr>
<td>7</td>
<td>Delays in certification and undertaking final inspections</td>
<td>36.0</td>
</tr>
<tr>
<td>9</td>
<td>Control of traffic and restrictions on project sites</td>
<td>12.8</td>
</tr>
<tr>
<td>10</td>
<td>Changes in government regulations</td>
<td>11.6</td>
</tr>
<tr>
<td>11</td>
<td>Other</td>
<td>8.1</td>
</tr>
</tbody>
</table>

Source: Author (2016)

4.2.3.9 Overall Ranking of Time Overrun Causes

The seventy eight (78) factors which literature review identified to be affecting time overruns in road construction projects were ranked using their frequencies in order to determine the frequent factors affecting road construction projects in Malawi. Ranking results of factors affecting road construction projects based on their frequency indexes are presented in Appendix 2.

However the top most frequent factors affecting the road construction projects are presented in the table below.
Table 16: Top 15 Frequent Causes of Time Overruns in Road Project in Malawi

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Frequent Causes of Time Overruns in Road Construction Projects</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Inadequate Planning</td>
<td>81.4</td>
</tr>
<tr>
<td>2</td>
<td>Inadequate financial capacity to finance projects</td>
<td>77.9</td>
</tr>
<tr>
<td>3</td>
<td>Delays in processing contractors’ payments</td>
<td>76.7</td>
</tr>
<tr>
<td>4</td>
<td>Delays in mobilising to project sites</td>
<td>75.6</td>
</tr>
<tr>
<td>5</td>
<td>Slow decision making processes</td>
<td>67.4</td>
</tr>
<tr>
<td>5</td>
<td>Delayed approvals for major changes in the scope of works</td>
<td>67.4</td>
</tr>
<tr>
<td>7</td>
<td>Workers risky behaviour</td>
<td>66.3</td>
</tr>
<tr>
<td>8</td>
<td>Poor planning and scheduling of project activities</td>
<td>64.0</td>
</tr>
<tr>
<td>9</td>
<td>Fluctuation of material prices</td>
<td>62.8</td>
</tr>
<tr>
<td>10</td>
<td>Political interference</td>
<td>61.6</td>
</tr>
<tr>
<td>11</td>
<td>Delays in certifying contractors’ payment certificates</td>
<td>59.3</td>
</tr>
<tr>
<td>11</td>
<td>Unavailability of equipment</td>
<td>59.3</td>
</tr>
<tr>
<td>11</td>
<td>Effects of weather on road construction works</td>
<td>59.3</td>
</tr>
<tr>
<td>14</td>
<td>Unavailability of qualified workforce</td>
<td>58.1</td>
</tr>
<tr>
<td>15</td>
<td>Design changes by clients during construction</td>
<td>57.0</td>
</tr>
</tbody>
</table>

Source: Author (2016)

4.2.3.10 Ranking of Causes of Time Overruns in Road Projects Based on Causes

Literature review classified the factors causing time overruns in road construction projects in Malawi into eight (8) groups. An average of the frequency indexes in each group was calculated and then ranked in order to determine the group of causes of time overruns whose effect road construction projects is dominant. The table below shows the ranking of the groups of time overrun causes in road construction projects in Malawi.
### Table 17: Group Ranking of Causes of Time Overruns in Road Project

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Group of Causes of Time Overruns in Road Projects</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Client/Owner related causes of time overruns</td>
<td>42.6</td>
</tr>
<tr>
<td>2</td>
<td>Consultant related causes of time overruns</td>
<td>42.2</td>
</tr>
<tr>
<td>3</td>
<td>Equipment related causes of time overruns</td>
<td>41.4</td>
</tr>
<tr>
<td>4</td>
<td>Health and Safety related causes of time overruns</td>
<td>40.4</td>
</tr>
<tr>
<td>5</td>
<td>Labour related causes of time overruns</td>
<td>37.9</td>
</tr>
<tr>
<td>6</td>
<td>External related causes of time overruns</td>
<td>36.5</td>
</tr>
<tr>
<td>7</td>
<td>Contractor related causes of time overruns</td>
<td>30.1</td>
</tr>
<tr>
<td>8</td>
<td>Material related causes of time overruns</td>
<td>25.9</td>
</tr>
</tbody>
</table>

*Source: Author (2016)*

### 4.2.4 Effects of Time Overruns in Road Construction Projects

Respondents to the survey were asked to rank the effects of time overruns in road construction project in Malawi. The analysis of the data revealed cost overruns (89.5%) as the most dominant effect of time overruns followed by extension of the performance period with (74.4%) on second and claims (52.3%) on third. Further analysis of the data ranked disputes between contractual parties (38.4%) as the fourth effect of time overruns followed by contract termination (37.2%) on fifth and loss of profits on the part of the contractor (34.9%) ranked sixth. Project abandonment (32.6%) was ranked seventh on the list of the effects of time overruns followed by poor quality of work due to hurried execution (27.9%) on eighth and negative social impact (19.8%) on ninth position. A further analysis revealed that idling of resources (18.6%) as the tenth ranked effect followed by the clients’ delayed profits/services from the project (15.1%) on eleventh and bankruptcy on the part of the client (9.3%), arbitration (9.3%) and delayed loan/credit repayment on the part of the client (9.3%) being
ranked twelfth. Additionally the analysis ranked stress emanating from the time overruns on the project team (5.8%) on fifteenth followed by litigation (3.5%) on sixteenth and loss of employees (2.3%) on seventeenth and others (12%) being the lowest ranked on eighteenth. Other effects on road construction projects in Malawi comprised of the following: inconveniencing road users, increased cost of vehicle maintenance, increased travel time and distance due use of alternative routes. The table below gives a summary of the effects of time overruns in road construction projects in Malawi.

**Table 18 : Effects of Time Overruns in Road Construction Projects in Malawi**

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Effects of Time Overruns in Road Construction Projects in Malawi</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cost overruns</td>
<td>89.5</td>
</tr>
<tr>
<td>2</td>
<td>Extension of the performance period</td>
<td>74.4</td>
</tr>
<tr>
<td>3</td>
<td>Claims</td>
<td>52.3</td>
</tr>
<tr>
<td>4</td>
<td>Disputes between contractual parties</td>
<td>38.4</td>
</tr>
<tr>
<td>5</td>
<td>Termination of the contract</td>
<td>37.2</td>
</tr>
<tr>
<td>6</td>
<td>Loss of profits on the part of the contractor</td>
<td>34.9</td>
</tr>
<tr>
<td>7</td>
<td>Project abandonment</td>
<td>32.6</td>
</tr>
<tr>
<td>8</td>
<td>Poor quality of work due to hurried execution of works</td>
<td>27.9</td>
</tr>
<tr>
<td>9</td>
<td>Negative social impact</td>
<td>19.8</td>
</tr>
<tr>
<td>10</td>
<td>Idling of resources</td>
<td>18.6</td>
</tr>
<tr>
<td>11</td>
<td>Delaying clients in getting profits/services from the projects</td>
<td>15.1</td>
</tr>
<tr>
<td>12</td>
<td>Bankruptcy on the part of the client</td>
<td>9.3</td>
</tr>
<tr>
<td>12</td>
<td>Arbitration</td>
<td>9.3</td>
</tr>
<tr>
<td>12</td>
<td>Delaying of the client in repaying back loans</td>
<td>9.3</td>
</tr>
<tr>
<td>15</td>
<td>Creation of stress on the project team</td>
<td>5.8</td>
</tr>
<tr>
<td>16</td>
<td>Litigation</td>
<td>3.5</td>
</tr>
<tr>
<td>17</td>
<td>Loss of employees</td>
<td>2.3</td>
</tr>
<tr>
<td>18</td>
<td>Other</td>
<td>1.2</td>
</tr>
</tbody>
</table>

*Source: Author (2016)*
4.2.5 Measures for Mitigating Time Overruns in Road Construction Projects

Furthermore, respondents to the survey were also asked to rank measures which can be effected to minimise the occurrence of time overruns in road construction projects in Malawi. An analysis of the data ranked proper project planning (73.3%) first followed by effective and efficient management of project sites and supervision works (59.3%) on second and availability of complete and proper designs at the commencement of the project (47.7%) on third. The analysis further ranked the data coordination between the construction team (40.7%) fourth followed by the use of accurate estimates when formulating the bills of quantities (38.4%) on fifth; and effective strategic planning (34.9%) and adherence to construction specifications (34.9%) on sixth respectively. The use of appropriate construction methods (29.1%) was ranked eighth, with use of proper and modern equipment (22.1%) and conduction of frequent progress meetings (22.1%) on ninth respectively; followed by collaborative working spirit by the project team (17.4%) on eleventh and use of proper methods when procuring construction materials (15.1%) on twelfth. The analysis further ranked constructing according to issued drawings (11.6%) thirteenth with the establishment of proper communication channels (10.5%) and use of up to date technology (10.5%) of fourteenth respectively. Other measures comprising of: secure funding for projects, flexibility on the use of new methodologies and engagement of qualified and experienced personnel (9.3%) were ranked sixteenth and fast tracking of project activities while not compromising on quality being the least ranked measure (4.7%) on seventeenth.
Table 19: Effects of Time Overruns in Road Construction Projects in Malawi

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Measures for Minimising Time Overruns in Road Construction Projects in Malawi</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Proper project planning and scheduling</td>
<td>73.3</td>
</tr>
<tr>
<td>2</td>
<td>Effective and efficient management of project sites and supervision works</td>
<td>59.3</td>
</tr>
<tr>
<td>3</td>
<td>Complete and proper designs at the commencement of the project</td>
<td>47.7</td>
</tr>
<tr>
<td>4</td>
<td>Coordination between the construction team</td>
<td>40.7</td>
</tr>
<tr>
<td>5</td>
<td>Use of accurate cost estimates when formulating bills of quantities</td>
<td>38.4</td>
</tr>
<tr>
<td>6</td>
<td>Effective strategic planning</td>
<td>34.9</td>
</tr>
<tr>
<td>6</td>
<td>Adherence to construction specification</td>
<td>34.9</td>
</tr>
<tr>
<td>8</td>
<td>Employing appropriate construction methods</td>
<td>29.1</td>
</tr>
<tr>
<td>9</td>
<td>Use of proper and modern equipment</td>
<td>22.1</td>
</tr>
<tr>
<td>9</td>
<td>Conducting frequent progress meetings</td>
<td>22.1</td>
</tr>
<tr>
<td>11</td>
<td>Collaborative working spirit by the construction team</td>
<td>17.4</td>
</tr>
<tr>
<td>12</td>
<td>Use of proper methods in procuring construction materials</td>
<td>15.1</td>
</tr>
<tr>
<td>13</td>
<td>Constructing according to issued drawings</td>
<td>11.6</td>
</tr>
<tr>
<td>14</td>
<td>Establishing clear communication channels</td>
<td>10.5</td>
</tr>
<tr>
<td>14</td>
<td>Use of up to date technology</td>
<td>10.5</td>
</tr>
<tr>
<td>16</td>
<td>Other</td>
<td>9.3</td>
</tr>
<tr>
<td>17</td>
<td>Fast-tracking construction works while not compromising on quality</td>
<td>4.7</td>
</tr>
</tbody>
</table>

Source: Author (2016)
CHAPTER 5: DISCUSSION OF RESULTS

5.0 CHAPTER INTRODUCTION

Findings from the analysed data are discussed in this chapter in relation to the literature reviewed, research objectives and the research questions. Discussions on the findings will assist in the determining whether solutions to the research problem have been realised from the research findings. From the research findings the study will draw up conclusions in relation to the research objectives and make recommendations.

5.1 TIME OVERRUN CAUSES IN ROAD CONSTRUCTION PROJECTS

Discussions on the causes of time overruns in road construction projects in Malawi will focus on the top ten ranked factors based on their frequency indexes. The top ten factors that cause time overruns are discussed in the following paragraphs:

5.1.1 Inadequate Planning

Inadequate first on causes of time overruns in road construction projects in Malawi. Clients are mainly blamed for their failure to secure adequate and reliable funding for projects resulting in delayed payments or complete project abandonment, changing designs to suit available budgets during implementation, issuance of incomplete designs at tender and use of non-donor requirement compliant designs at tendering stage and are re-designed during implementation resulting in time overruns. These findings are similar to the (Kikwasi, 2012) where use of incomplete designs at tender was identified as the cause of time overruns in projects. A review of PCR on Mchinji-Kasungu – Msulira in Malawi identified non-donor requirement compliant designs and failure to secure adequate and reliable funding from GoM as the causes of time overruns in projects. However these findings are in agreement with findings by
(Kamanga & Steyn, 2013) and (Kivaa, 2000) who identified delays in processing payments and unrealistic estimations of project durations as the causes of time overruns related to clients in projects.

5.1.2 Inadequate financial capacity to finance project

Most of the contractors in Malawi who are involved with construction of roads are not financially sound resulting in them being dependent on interim payments from project owners. Once payments are delayed by clients, contractors who do not adequate resources end up suspending the works thereby losing time. This is in agreement further compounded by the contractors’ lack of understanding of finance and accounting principles which results in their failure to save resources from completed projects in order to pre-finance future projects (Theodore, 2009) and (Aigbavboa, et al., 2014).

5.1.3 Delays in processing contractors’ payments

Delays in processing contractors’ payments negatively affect progress of works on road construction projects since most contractors do not have adequate cash flows to support the execution of works on site. As a result contractors tend to suspend the execution of works on site whilst they wait for the processing of payments. This in turn results in the works not being completed within the agreed time frame since time was lost as the contractor waited for payment. This assertion is in agreement with results of study by (Kamanga & Steyn, 2013) in Malawi, (Akgobe, et al., 2013) in Benin, (El-Razek, et al., 2008) in Egypt and (Le-Hoai, et al., 2008).

However, these results are not in agreement with results from a study conducted in Kenya by (Kivaa, 2000) where clients were faulted on setting unrealistic project durations resulting in time overruns.
5.1.4 Delays in mobilising to projects sites

Delays by contractors in mobilising to project sites were highlighted as one of the causes of time overruns in road construction projects in Malawi. The delays were attributed to contractors’ inability of mobilise resources with which to kick start the works on the project hence time being lost resulting in failure to complete the works within the contract duration. These findings supported by findings of by (Aigbavboa, et al., 2014) in Zambia, (Frimpong, et al., 2003) in Ghana and (Memon, 2014) where delays in mobilising to sites by contractors was identified as a cause of time overruns. However, (Theodore, 2009) is not in agreement with this assertion as time overruns related to contractors are attributed to delays in the approval of drawings and material samples, revised designs and poor communication and coordination between the contractual parties.

5.1.5 Slow decision making processes

Further, the results revealed that delays by clients to make important decisions to do with project implementation results in loss of time which eventually make it practically impossible for contractors to complete the execution of the works within the stipulated project duration; hence the contractors requiring additional time to cover up for the lost time. Findings by (Al-Hejji, 2006) agree with this assertion that clients delays in making decisions results in time overruns in road construction. However (Kikwasi, 2012) citing (Hasseb, et al., 2011) attributed time overruns related to clients in projects to late or delayed payments for completed works and labour issues.

5.1.6 Delayed approvals for major changes in the scope of works

Delays in the approval of major scope changes is one of the causes of time overruns which respondents to the study attributed to the consultant in the implementation of road construction works. The potential effects of major changes in the scope of works
on a project include increased project costs, additional payments to contractors and increased overhead costs. These findings are in agreement with findings by (Osman, et al., 2009), (Wei, 2010) and (Theodore, 2009) who identified delays in the approval of major scope of works as a cause of time overruns in road construction projects.

However, these findings contradict with results of study by (Ren, et al., 2008) in Dubai who identified durations to inspect completed works as the cause of time overruns in projects related to consultants. Further (Mohammed & Isah, 2012) in Nigeria identified design errors as the major cause of time overruns in construction projects while (Motaleb & Kishk, 2010) attributes consultants’ inexperience to time overruns in construction projects.

5.1.7 Workers risky behaviour

Risky behaviours by workers on construction sites have the potential to cause accidents which may result in life losses, injuries, plant and machine breakdowns which have effects on contract durations in construction projects. These results are in agreement findings of the (Work Safe New Zealand, 2016) identified working when tired, sick or injured, making mistakes deliberately, taking minds off work issues, working in unsafe areas, pressure from bosses resulting in mistakes, short cuts on purpose (to save time) and use of faulty machinery or equipment on breakdown as workers risky behaviours.

5.1.8 Poor planning and scheduling of project activities

Poor planning and scheduling of project activities was ranked highly by respondents on the causes of time overruns in construction projects related to contractors in Malawi. This results in contractors working executing works which are tolerant with weather resulting in suspension of works and mobilising resources which are not required at a particular point in time while leaving out the necessary one hence a lot of
wastage on time. These results are in agreement with findings by (Aigbavboa, et al., 2014) in Zambia where ineffective planning and scheduling of projects were identified as causes of time overruns in construction projects related to contractors.

5.1.9 Fluctuation of material prices

Time overruns in road construction projects are sometimes a result of material price fluctuations if proper procedures of encountering this were not established at contract formulation. As a result, works whose material prices fluctuate suffer since contractors tend to avoid works whose material prices have fluctuated to avoid making losses resulting in delayed completion of the intended works until a decision on time overruns is made. Findings by (Akintoye & Fitzgerald, 2000) and (Le-Hoai, et al., 2008) identified material price changes as one of the causes of time overruns related to materials.

However (Moura & Teixeira, 2006) established that time overruns in construction projects are not caused by changes in material prices but rather material run out, delays in procuring materials and changes in material specifications. (Pourrostam & Ismail, 2011) and (Shaikh, et al., 2010) identified delayed delivery of materials as the major cause of time overruns in construction projects related to materials.

5.1.10 Political interference

Respondents to the study identified political interference as one of the external factor related cause of time overruns in projects as often times in Malawi, politicians have directed contractors to execute emergency or additional works outside. As a result contractors tend concentrate on the additional works since in most cases its additional money on the contract which will require additional time hence going beyond the stipulated contract duration. As a result contact durations and budgets are affected. This assertion is supported by (Aigbavboa, et al., 2014) who identified political
interference as one of the external related factors causing time overruns in construction projects.

5.1.11 Delays in certifying contractors’ payment certificates

Amongst the highly ranked factors related to consultant that cause time overruns in road construction projects are delays in certifying contractors’ payment certificates before forwarding them to clients for payments. This is attributed to lack of coordination between contractual parties on site resulting in measurement of completed works being done separately. This potentially results in delayed payments and for contractors who are not financially capable may lead to suspension of works while awaiting payment. Studies by (Kamanga & Steyn, 2013) in Malawi and (Akgobe, et al., 2013) in Benin established that delayed payments to contractors results in some contractors suspending the works thereby making it practically impossible to complete construction works within the stipulated durations; hence time overruns.

5.1.12 Unavailability of equipment

Results of the analysed data of causes of time overruns related to equipment identified the equipment unavailability as the major cause of time overruns in road construction projects. This is supported by findings of a study by (Halikas, et al., 2010) in Uganda where difficulties in buying and transporting construction equipment due to high costs have immensely contributed to equipment in landlocked countries, and Malawi is not an exception. Further studies by (Aigbavboa, et al., 2014) and (Wei, 2010) agree with the assertion that unavailability of equipment causes time overruns in road construction projects.

While agreeing with equipment unavailability assertion on time overruns (Rivas, et al., 2011) attributed time overruns related to equipment in road construction projects to low level of equipment operators’ skills.
5.1.13 Effects of weather on road construction works

Respondents to the study questionnaire identified the effects of weather as a cause of time overruns in construction projects linked to external factors. This assertion is supported by the findings of (Sambasivan & Soon, 2007) who found that construction works in Malaysia are affected by weather resulting in time overruns. The findings are further supported by study findings by (Kamanga & Steyn, 2013) and (Aigbavboa, et al., 2014) in Malawi and Zambia, where weather effects were noted to be one of the external factors that cause time overruns in construction projects.

These assertions are in sharp contract with the findings by (Mahamid, et al., 2012) in West Bank, where external factor related causes of time overruns in construction projects are attributed to the awarding of contracts to lowest evaluated bidders.

5.1.14 Unavailability of qualified workforce

The study further identified the unavailability of qualified workforce as a cause for time overruns in road construction projects related to labour in Malawi. These results are in agreement with findings by (Ndenguma, 2013) in Malawi identified unavailability of qualified/competent personnel as a cause of time overruns in construction projects related to labour.

On the contrary, studies by (Aigbavboa, et al., 2014) in Zambia and (Sambasivan & Soon, 2007) in Malaysia identified low productivity levels of workers as a cause of time overruns related to labour.

5.1.15 Design changes by clients during construction

Respondents to the study, identified design changes during construction by clients as one of the causes of time overruns in construction projects since project durations are estimated based on the designs available at that particular (Kivaa, 2000). As such any
change in the design has an impact on the project duration since consultants have to re-work on the design in the course of implementing the works. These results are in agreement with findings by (Memon, 2014) in Malaysia where frequent design changes were identified as the cause of time overruns in construction projects linked to clients.

These findings are not in agreement with findings by (Seboru, 2015) in Kenya who identified delayed payments, bureaucracy and slow decision making as causes of time overruns related to clients.

5.2 EFFECTS OF TIME OVERRUNS IN ROAD PROJECTS

Findings of the data analysis are presented in this section in relation to the effects of time overruns which were identified in Chapter 2.

5.2.1 Cost Overruns

Findings from the respondents’ ranking of the effects of time overruns in road construction projects, ranked cost overruns first with a frequency value of 89.5%; agreeing with findings by (Denini, 2010) in Libya and (Sunjka & Jacob, 2013) in Niger Delta while differing with findings by (Chileshe & Berko, 2010) in Ghanaian road construction projects where time overruns were attributed to delays in processing payment certificates and variation orders.

5.2.2 Extension of Performance Period

Extension of the performance period with (74.4%) frequency value was ranked as the second dominant effect of time overruns in road construction projects agreeing with findings by (Sunjka & Jacob, 2013) and (Denini, 2010) whilst differing with findings by (Vidalis & Najafi, 2002) who attributed time overruns to internal and external causes that affect relationships.
5.2.3 Claims

Claims with a frequency index of 52.3% were ranked third on the effects of time overruns, and this is supported by the findings by (Sunjka & Jacob, 2013) though not in agreement with findings by (Saleh, et al., 2009) who identified being declining reputation and blacklisted by authorities as effects of time overruns.

5.2.4 Disputes between contractual parties

Ranked fourth on effects of time overruns are disputes between contractual parties (38.4%) which is in agreement with findings by (Denini, 2010) in Libya and (Sunjka & Jacob, 2013) in Niger Delta. However findings by (Saleh, et al., 2009) are not in agreement with this assertion since their findings had loss of resources (money and time) as effects of time overruns in construction projects.

5.2.5 Contract termination

Contract termination (37.2%) was the fifth ranked effect of time overruns in road construction projects agreeing with findings by (Sunjka & Jacob, 2013) while differing with findings by (Saleh, et al., 2009) in Libya where declining reputation and loss of interest by project stakeholders were identified as the effects of time overruns in construction projects.

5.2.6 Loss of profits by contractors

Loss of profits on the part of the contractor (34.9%) due to time overruns was ranked sixth on the effects of time overruns in road construction projects. This is supported by findings by (Kikwasi, 2012) where loss of profits was identified as an effect on time overruns in construction projects. However, this assertion disagrees with findings by (Denini, 2010) where decrease in financial commitment by owners and negative social impacts were identified as the effects of time overruns.
5.2.7 Project abandonment

Further analysis of the effects of time overruns ranked project abandonment (32.6%) seventh on the effects of time overruns in construction agreeing with findings by (Kikwasi, 2012) and (Sunjka & Jacob, 2013) in their respective studies on the effects of time overruns in construction projects. However, this is not in agreement with findings by (Saleh, et al., 2009) in Libya where blacklisting by authorities and reputation decline were identified as effects of time overruns in construction projects.

5.2.8 Poor quality of work due to hurried execution

Poor quality of work due to hurried execution of work (27.9%) was ranked eighth on the effects of time overruns. This notion is supported by findings by (Hasseb, et al., 2011) where total project abandonment was identified as one of the effects of time overruns. However, these findings differ from findings by (Saleh, et al., 2009) in Libya who loss of interest in the project by stakeholders and loss of profits as some of the effects of time overruns in construction projects.

5.2.9 Negative social impact

Negative social impact of the project (19.8%) was ranked ninth of the dominant effects on time overruns in construction projects, agreeing with findings by (Kikwasi, 2012) where communities have not been in a position to realise benefits of the projects within the allocated time frame. These findings differ from findings by (Sunjka & Jacob, 2013) who identified cost overruns and poor quality of completed projects due to hurried execution of works.

5.2.10 Idling of resources

Idling of resources (18.6%) was ranked tenth on the effects of time overruns in agreeing with findings by (Kikwasi, 2012) in Tanzania; where resources in form of plant spend much time on the project than expected resulting in other projects not
being able to make use of the same. However these findings are different from findings by (Denini, 2010) where claims and reduced quality of works identified as effects of time overruns in construction projects.

5.3 MEASURES FOR MITIGATING TIME OVERRUNS IN ROAD CONSTRUCTION PROJECTS

This section gives background to the results of the ranked data and their relevance to results of the literature review as presented in Chapter 2.

5.3.1 Proper project planning and scheduling

Proper project planning and scheduling was ranked (73.3%) was ranked first on the measures which can be employed to minimise the occurrence of schedule overruns in construction project. This in agreement with findings by (Abdelnaser, et al., 2005) where proper planning and scheduling entailing adequate and available source of finance and selection of reliable and competent contractors. However this differs with findings by (Aibinu & Jagboro, 2002) where acceleration of site activities was identified as measure for minimising time overruns.

5.3.2 Effective and efficient management of sites and supervision works

Respondent's further ranked effective and efficient management of project site and supervision works (59.3%) second, and this is in agreement with findings by (Abedi, et al., 2012) where effective and efficient management in project sites tremendously reduced the occurrence of time overruns. These finding are different from findings by (Nguyen, et al., 2004) where availability of resources and having a multidisciplinary competent project team were identified as measures which can minimise time overruns in construction projects.
5.3.3 Complete and proper designs at the commencement of the projects

Analysis of the data ranked complete and proper designs at project commencement (47.7%) third on the measures for minimising time overruns in construction projects. This agrees with findings by (Assaf, et al., 1995) on the need of having complete and proper designs at project commencement since there is no idle to for contractors whilst they await for the designs hence avoiding time overruns. However, this notion differ from findings by (Odeh & Battaineh, 2002) who established that effecting liquidated damages and offering incentives for timely completion of works as measures which can minimise time overruns in construction projects.

5.3.4 Coordination between the construction team

Respondents’ ranked coordination between the construction team (40.7%) fourth on the measures for minimising time overruns in construction projects. A well coordinated team on a construction site eliminate time wasting activities through coordination in project schedules thereby ensuring that project activities are executed as planned. Agreeing with this assertion are findings by (Sambasivan & Soon, 2007) where delayed approvals for drawings and work plans were identified as causes of time overruns in projects due to lack of coordination.

5.3.5 Use of accurate cost estimates when formulating bills of quantities

Use of accurate initial cost estimates (38.4%) was ranked fifth on the measures for minimising time overruns as it minimises the waiting time for approval of rates which were inaccurately formulated at contract formulation. This is in agreement with findings by (Abedi, et al., 2012) who identified the use of initial accurate cost estimates as measure of minimising time overruns; which differ from findings by (Aibinu & Jagboro, 2002) whose findings revealed acceleration of site activities and provision of contingency allowance.
5.3.6 Effective strategic planning

Further data analysis ranked effective planning (34.9%) sixth on the list of measures for minimising time overruns as delays in mobilising to sites of competent personnel, equipment and materials are eliminated thus ensuring that all project activities are on schedule. Findings by (Abedi, et al., 2012) and (Nguyen, et al., 2004) support this assertion differing with findings by (Aibinu & Jagboro, 2002) who identified acceleration of project activities and provision of contingency funds as measures for minimising time overruns in construction projects.

5.3.7 Adherence to construction specifications

Respondents’ ranked adherence to construction specification (34.9%) seventh amongst the measures which can minimise time overruns in construction projects if followed since re-works due to works not meeting standards are completely eliminated hence avoiding the need for additional time for re-works. This is supported by findings by (Ren, et al., 2008) where non adherence to specifications was identified as a cause of time overruns in projects on the contractors’ part. This notion differs from findings by (Assaf, et al., 1995) and (Sambasivan & Soon, 2007) where inadequate and well motivated staff; and engagement of incompetent personnel were attributed to contractors’ failure to execute works within the stipulated duration.

5.3.8 Employing appropriate construction methods

Ranked on eight on the measures for minimising time overruns in construction projects is the use of appropriate construction methods (29.1%) since the occurrence of waste, cost and time overruns in construction projects is minimised. These findings are in agreement with findings by (Abedi, et al., 2012) where appropriate construction methods were identified as measures for minimising time overruns in construction projects.
5.3.9 Use of proper and modern equipment

Respondents’ to the study ranked use of proper and modern equipment (22.1%) on ninth position on the measures of minimising time overruns in road construction projects. As such works are executed in an efficient way resulting in less time being spent at work hence avoiding time overruns. This agrees with findings by (Aigbavboa, et al., 2014) and (Enshassi, et al., 2009) on the proper and modern equipment has an effect on time taken to execute works differing with findings by (Rivas, et al., 2011) in Chile the where time overruns are attributed to low level of skills on the part of the operators.

5.3.10 Conducting frequent progress meetings

Frequent site meetings on construction sites (22.1%) were ranked tenth on the measures which minimise time overruns since they provide a platform where progress reports, challenges and emerging issues are presented with an aim of chatting the way forward. This is supported by findings by (Abedi, et al., 2012) who established that time overruns can be minimised though the holding of frequent progress meetings.
CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.0 CHAPTER INTRODUCTION

In this chapter conclusions and recommendations are made regarding the causes, effects and measures which can be implemented in road construction projects in Malawi to counter time overruns.

The first objective of the study was to determine the causes of time overruns in road construction projects. The second objective was to analyse the effects of time overruns in road construction projects and third one was to recommend the measures which can be employed to minimise the occurrence of time overruns in road construction projects.

6.1 CONCLUSIONS

Findings from the study are thus concluded as follows:

6.1.1 Factors Causing Time Overruns in Road Construction Projects

This section concludes on the top factors that causes time overruns in road construction projects in Malawi. 85 factors were identified as causes of time overruns in road construction projects, but the study has picked the top fifteen causes.

Further, the section will fulfill Research Objective No. 1:

“to determine major causes of time overruns in road construction projects in Malawi”

and answer Research Question No. 1 of the study:

“what are the major causes of time overruns in road construction projects in Malawi?”
6.1.1.1 *Inadequate Planning*

Results from the study indicated that “inadequate planning on the part of the client” was the major cause of time overruns in road projects resulting in resource idling due to incomplete/ errors in designs, compensation issues rendering sites inaccessible and delayed payments due to lack of funding. As such clients should ensure designs are completed, sites are accessible and secure funding is in place before awarding contracts as a way of minimising time overruns in road construction projects.

6.1.12 *Inadequate financial capacity to finance projects*

Contractors’ inability to finance projects result in time overruns since their dependence is on clients to pay advance payments to procure equipment and works payments to pay for materials and wages. As such any delayed payment by the client will have an effect on the project duration hence the need to ensure that projects are awarded to contractors with financial capacity to ensure that there no work stoppages due lack of funds hence minimising time overruns.

6.1.1.3 *Delays in processing contractors’ payments*

Delays in processing contractors’ payments were ranked third on the top ten factors causing time overruns in road construction projects. This emphasises the importance of having funds during project implementation. As such clients should secure reliable and adequate funding before implementing road construction project to avoid time overruns emanating from lack of materials on site and sit ins by workers.

6.1.1.4 *Delays in mobilising to sites*

Delays by contractors in mobilising to sites were identified as one cause of time overruns in road projects. Such delays were attributed to inadequate financial and technical capacity on the part of the contractors. As such client organisation should
ensure that projects are awarded to contractors who have the capacity to kick start the
works while advance payments are being processed.

6.1.1.5 Slow decision making processes by clients

Slow decision making processes by clients often result in time overruns in projects. As such clients should ensure that decisions pertaining to crucial project activities are made in time to avoid time runs. This can further be enhanced by the secondment of the clients' organisation who will be involved in the daily activities of the project since any delay in decision making has an effect on the contract duration.

6.1.1.6 Delayed approvals for major changes to the in the scope of works

Results indicated that delays by Consultants in approving major changes in the scope caused time overruns in road construction projects. As such consultant should ensure that such decision are made in good time since any delay in making such decisions may lead to stoppage of works and consequent time overruns.

6.1.1.7 Workers risky behaviour

The need to have a health work force on site cannot be over emphasised as this results in high production rates. As such the contractual parties on site should ensure that the works force is properly ensure that the work force is working in their right frame of mind with non-faulty equipment or plant to avoid loss of lives, bodily harm and equipment breakdowns which cause delays in the execution of work on site resulting in time overruns. And in these days of the HIV- AIDS pandemic, workers in the construction industry need to be properly guided on their behaviours whey they are away from their families due to their by conducting health talks on sites..
6.1.1.8 **Poor planning and scheduling of project activities**

Poor planning and scheduling of project activities was identified as one of the causes of time overruns in road projects. Contractors were noted to scheduled some works which are practically impossible to execute during sometime of the year i.e. road surfacing and earth works in rainy season resulting in re-works due to poor quality of the works or suspension of the works which has an effect of the contract duration. As such contractors need to properly plan and schedule their activities to avoid time overruns.

6.1.1.9 **Fluctuation of material prices**

Fluctuation of materials prices was ranked as one of the causes of time overruns in road construction projects. This decelerates the execution of works on site since contractors tend avoid works whose materials prices have risen and provision for escalation was not made. Clients should ensure that contracts should have price adjustments in an event that material prices escalates to avoid deceleration of project activities.

6.1.1.10 **Political Interference**

Political Interference was ranked highly on the causes of time overruns in road construction projects. Politicians have often times issued directives from the political podium to contractors working on a different project to execute emergency or additional works outside their scope. Contractors rush to execute such works since they know its additional money to them. However, this has an effect on the duration of the original contract since works may have been suspended. As such politicians should avoid issuing directives from the podium if time overruns are to be minimised in road construction projects.
6.1.1.11 Delays in certifying payments for contractors

Consultant’s delay in certifying contractors was identified as another cause for time overruns in construction projects. This is mostly attributed to lack of coordination between the consultants’ and contractors’ staff on site which results in each one of them taking measurements for completed works separately and then requiring time to go and do joint measurements resulting in delayed certification. As such both parties should endeavour to execute joint measurement together to avoid time losses on certification which may result in time overruns due to delayed payments.

6.1.1.12 Unavailability of equipments

Unavailability of equipment was amongst the frequent causes of time overruns in road construction projects in Malawi. Equipment plays an important role in the speedy execution of works hence its unavailability results in delayed completion of works. As such contractors should ensure that the necessary equipment is available on site to ensure timely completion of works hence avoiding time overruns in road projects.

6.1.1.13 Effects of weather of road construction works

Effects of weather were ranked highly on the untimely completion of road works. As such contractors should properly schedule their works on site by considering the natural effects of weather. Further consultants should scrutinise properly contractors’ plans so that the effects of weather are taken into account thereby minimising time overruns in the execution of works.
6.1.1.14  Unavailability of labour

Unavailability of labour on project sites results in delayed completion of works. Contractors should plan properly to secure labour in time so that during implementation no delays are experience there by mitigating the occurrence of time overruns.

6.1.1.15  Design changes by clients during road constructions

Design changes by clients during road construction results in stoppage of works in order to allow for re-designing. Time lost as consultant executes the re-designs affects the entire contract duration. As such, clients should ensure that all design changes are executed before site handovers in order to avoid time overruns in road construction projects.

6.1.2  Effects of time Overruns in Road Construction Projects

In this section, conclusions are made of the effects of time overruns in road construction projects in Malawi.

Further, the section will fulfil Research Objective No. 2:

“to determine the effects of time overruns in road construction projects in Malawi?”

and answer Research Question No.: 2 of the study:

“what are the major effects of time overruns in road construction projects in Malawi?”

6.1.2.1  Cost overruns

Cost overruns in construction are additional costs in projects which emanate from poor project management, in this time management. Failure to complete works on time results in contractors raising claims for establishment on site and fees for consulting
services. As such clients should ensure that road projects are completed within their stipulated durations.

6.1.2.2 Extension of performance
Time overruns may result in the extension of the performance period at no cost to the client from the contractor. However, the delay in completing the project may result in a disservice to the users as they continue to experience long travel time and high transportation charges due to the use of alternative routes poor road sections.

6.1.2.3 Claims
Time overruns may also result in contractors raising claims for the additional time on site to cater for establishment, operational costs for equipment and wages as these are usually not taken into account if the time overrun was due to clients’ or contractors’ in action on crucial contractual matters. As such clients should endeavour to avoid time overruns in road construction projects.

6.1.2.4 Disputes between contractual parties
Disputes may arise in contracts if causes of time overruns are not properly documented on site. This in turn results in animosity onsite between the contractual parties thereby affecting further progress and quality of works on site.

6.1.2.5 Termination of the contract
Client can terminated contracts in an event that works have not been completed within the stipulated time in order to avoid cost overruns emanating from contractors’ establishment and consultancy fees.
6.1.2.6  Loss of profits on the part of the contractor

Contractors' continued stay on site after the expiry of the stipulated period for a contract may result in loss of profits since they will be required to pay for services and wages which were not planned thereby incurring losses.

6.1.2.7  Project abandonment

Continued time overruns in projects results in complete abandonment of the project since the client continues to pay extra costs while contractors suffers losses due to settlement of wages and operational costs. As such, abandonment of the contract is inevitable.

6.1.2.8  Poor quality works due to hurried execution

Contractors who are paying liquidated damages due to time overruns tend to work faster with an aim of complete the outstanding works within a short time. This results in work of poor quality being executed on site.

6.1.2.9  Negative social impact

Projects which take long to complete tend to have negative social impact from the public since benefits from such projects are delayed. As a result the enthusiasm to benefit from the project wanes making it prone to vandalism since the users are not benefitting from it.

6.1.2.10  Idling of resources

Idling of resources was identified as one of the effects of time overrun as a result of accumulated hiring costs for hired plant and accrued interest on loans to finance road projects for both the contractor and the client; hence the avoidance of time overruns in road projects being inevitable.
6.1.3 Measures for minimising time overruns in road construction projects

This section makes conclusion on the top most measures which can be effected to minimise the occurrence of time overruns in road construction projects in Malawi

Further, the section will fulfil Research Objective No. 3:

“to recommend measures for minimising of time overruns in road construction projects in Malawi”

and answer Research Question Number Three:

“what are measures can be effected to minimise time overruns in road construction projects in Malawi?”

6.1.3.1 Proper project planning and scheduling of activities

Inadequate planning and scheduling of project activities on the part of the client will ensure that final designs, project funding and compensation issues are sorted out before site handovers thereby leaving no room for time wastages during project implementation.

6.1.3.2 Effective and efficient management of project site and supervision works

This entails executing works on site as scheduled in the programme of works and ensuring that any lapses on the critical path are brought back on track. Consultant should endeavour to see to it that works are being implemented as scheduled and that any lapses are taken care of. In so doing, time overruns mitigation can be achieved in road construction projects.
6.1.3.3 Complete and proper designs at project commencement

Results from the study indicate that having proper and complete designs at project commencement will mitigate time overruns since a lot of time on road construction sites is wasted through the waiting of re-designs.

6.1.3.4 Coordination between the construction team

Coordination of the construction team was identified as a measure which can mitigate time overruns in road projects since most activities will be done jointly hence eliminating time wastage through re-measurement of completed works, re-works and testing of materials hence no delays in approving the same.

6.1.3.5 Use of accurate cost estimates when formulating bills of quantities

Results from the study indicate that having accurate cost estimates when formulating bills of quantities will eliminate the chance of awarding contracts to low bidder who usually struggle to execute the works resulting in costly time overruns.

6.1.3.6 Effective strategic planning

Time overruns in road construction projects can be mitigated by effective strategic planning through the elimination of conflicts and confusion in priorities thereby helping one to focus on the set goals. Effective strategic planning ensures that proper care is taken of important aspects in road construction projects while less important aspects are not cared for. This eliminates time wastages in the implementation of road projects.

6.1.3.7 Adherence to construction specification

Time overruns in road construction projects can be mitigated through adherence to construction specification since there will be no room for reworks thereby reducing wastage on time.
6.1.3.8 **Employing appropriate construction methods**

Use of appropriate construction methods approved by the consultant mitigates the occurrence of time overruns since re-works will be avoided thereby avoiding time wastage.

6.1.3.9 **Use of proper and modern equipment**

Results of the study indicate the use of proper and modern equipment will reduce time overruns since currently the plant being used in the road construction industry if old and obsolete resulting in much time is spent on a section. However use of proper equipment will execute such works in a short period of time thus avoiding time overruns.

6.1.3.10 **Conducting frequent site meetings**

Frequent site meeting ensures that physical progress on site is checked regularly, whilst measures to expedite the execution of works and counter emerging issues are shared thereby mitigating time overruns in road construction projects.

6.2 **GENERAL RESEARCH CONCLUSION**

Findings from the study are in agreement with the causes of time overrun which were identified through literatures review of literature and were categorised into eight groups. Further, it has been established that time overruns in road construction projects are not caused by a singular factor.

Results from the study have also revealed that time overruns have corresponding effects hence the need to take into consideration the measures which have been proposed by the respondents in order to mitigate the occurrence of time overruns in road construction projects.
As such findings from this study will contribute to body of knowledge of the road construction industry in Malawi and offers solutions to some of the problems on time overruns in the road construction industry.

6.3 RECOMMENDATIONS

The following points are thus recommended to all contractual parties in the road construction industry as a way of minimising mitigating time overruns:

6.3.1 Secure reliable and adequate funding for the entire project duration

Project owners should ensure that before awarding contracts funding for the entire project duration since availability of funds has immense effects in the implementation of road construction projects if delayed.

6.3.2 Ensure availability of complete designs at project commencement

Project owners should ensure that complete designs are available at project commencement since incomplete designs have often been identified as the cause of time overruns in construction projects.

6.3.3 Awarding contracts to technically and financially capable contractors

Project owners should ensure that contracts are awarded to contractors who have technical and financial capabilities. Such contractors will be in a position to continue executing works even in time of erratic funding thereby avoiding time overruns in projects.

6.3.4 Government to revamp activities of P.V.H.O

Government should revamp the activities of Plant Vehicle Hire Organisation (PVHO) to ensure that there is proper, modern and adequate equipment on the construction industry market as a way of speeding the execution of road works since the equipment which is on the market is obsolete hence resulting in time overruns.
6.3.5 Implementation of measures for minimising time overruns in projects

Members of the construction team should ensure that the identified measure for minimising time overruns in road construction projects are being implemented at all stages of a project to minimise time overruns in road construction projects.

6.3.6 Frequent holding of progress site meetings

The construction team on site should ensure that progress site meetings are held frequently so that solutions for emerging issues and problems are proposed and agreed on before being implemented.

6.4 AREAS FOR FURTHER RESEARCH

Through the study it has been noted that most road construction project in Malawi are not completed within their scheduled durations. The following areas are recommended in order to ascertain the causes of time overruns in road construction projects:

- further research should carried to determine how contract durations are formulated,
- further research should be carried to determine the perceptions of contractors, clients and consultants on the causes of time overruns in projects since this study considered them as a homogenous population
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APPENDICES
APPENDIX 1: Letter Authorising the Research

MALAWI INSTITUTE OF MANAGEMENT
P.O. Box 30801
Capital City
Lilongwe 3

Telephone: (265) 710 866
Fax: (265) 710 609
Email: mimexecutive@mim.co.mw

Ref.No. MIM.3.170

20 February 2016

TO WHOM IT MAY CONCERN

Dear Sir/Madam:

AN INTRODUCTORY LETTER FOR MR. AAMON M. MUKASERA - 1408191

Mr. Aamon M. Mukasera is a student on an MSc in Project Management Programme, which is run by MIM in collaboration with the University of Bolton in the United Kingdom. He is now at the dissertation stage and his topic is "An Investigation into the causes, effects and measures for minimizing schedule overruns in road construction projects in Malawi."

Any assistance you can give him while he is collecting data and information through interviews and questionnaire will be greatly appreciated. You could also help by giving him any documents relevant to the study. I assure you that any information given to him will be treated in the strictest confidence.

We thank you in advance for your assistance.

Yours faithfully,

[Signature]

Hendrina G. Mosa (Ms)
PROGRAMME ADMINISTRATOR
for: EXECUTIVE DIRECTOR

hgm/...
APPENDIX 2: Request to Conduct a Research within RA

MEMORANDUM

To: The Chief Executive Officer
From: Project Engineer – ASWAAP SP Centre
Date: 16th March, 2016
Ref: Studies toward the attainment of a Master of Science Degree in Project Management – Dissertation Requirements

Subject: Request to conduct a research and use facilities and members of staff for my dissertation output

The above subject matter refers.

I am currently studying towards the attainment of a Master of Science Degree in Project Management with the University of Bolton – Off Campus Division (OCD) in collaboration with the Malawi Institute of Management (MIM) and my Registration Number 1408191/1.

Currently, I am at dissertation stage.

My dissertation topic is: "An Investigation into the causes, effects and measures for minimizing schedule overruns in road construction projects in Malawi"

In order to carry out the research successfully, I will need to access information, use facilities and interact with the members of staff of Roads Authority.

It is for these reasons and in keeping with the University of Bolton’s code of ethics that I have written to seek your permission to conduct this research.

I remain hopeful of a positive response from you, Sir.

Kindly accept my regards.

Amon M. Mukaanza
Project Engineer – ASWAAP SP

Att’d: Letter from supporting the cause.
APPENDIX 3: Authorisation Letter to Carry Out the Research within RA

Function Building
Off Paul KaGama Road
Private Bag B346
Lilongwe 3, Malawi

Tel: +265 (0) 1 759 154/156/468
Fax: +265 (0) 1 750 307
Email: ra@ra.org.mw
Website: www.ra.org.mw

Ref No.: RA/ADMIN/01/10

17th March 2016

Mr. Aamon Mukasera
C/O Roads Authority
Functional Buildings
Private Bag B346
Lilongwe 3

Dear Mr. Mukasera,

Re: Request to Conduct a Research and Use of Facilities and Members of Staff for Your Dissertation Output

Reference is being made to your written request dated 16th March 2016 on the subject above.

Please note that permission has been granted to you on your request on the understanding that you shall comply with provisions in Section 20.0 (Non disclosure of confidential information) as contained in our draft Conditions of Service. Please ensure that you are familiar with them.

Yours sincerely,

Eng. Trevor Hiwa
Chief Executive Officer

All correspondence to be addressed to the Chief Executive Officer.
APPENDIX 4: Ranking of All the Causes of Time Overruns in Road Projects

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Causes of Time Overruns in Road Construction Projects</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Inadequate Planning</td>
<td>81.4</td>
</tr>
<tr>
<td>2</td>
<td>Inadequate financial capacity to finance projects</td>
<td>77.9</td>
</tr>
<tr>
<td>3</td>
<td>Delays in processing contractors’ payments</td>
<td>76.7</td>
</tr>
<tr>
<td>4</td>
<td>Delays in mobilising to project sites</td>
<td>75.6</td>
</tr>
<tr>
<td>5</td>
<td>Slow decision making processes</td>
<td>67.4</td>
</tr>
<tr>
<td>5</td>
<td>Delayed approvals for major changes in the scope of works</td>
<td>67.4</td>
</tr>
<tr>
<td>7</td>
<td>Workers risky behaviour</td>
<td>66.3</td>
</tr>
<tr>
<td>8</td>
<td>Poor planning and scheduling of project activities</td>
<td>64.0</td>
</tr>
<tr>
<td>9</td>
<td>Fluctuation of material prices</td>
<td>62.8</td>
</tr>
<tr>
<td>10</td>
<td>Political interference</td>
<td>61.6</td>
</tr>
<tr>
<td>11</td>
<td>Delays in certifying contractors’ payment certificates</td>
<td>59.3</td>
</tr>
<tr>
<td>11</td>
<td>Unavailability of equipment</td>
<td>59.3</td>
</tr>
<tr>
<td>11</td>
<td>Effects of weather on road construction works</td>
<td>59.3</td>
</tr>
<tr>
<td>14</td>
<td>Unavailability of qualified workforce</td>
<td>58.1</td>
</tr>
<tr>
<td>15</td>
<td>Design changes by Clients during construction</td>
<td>57.0</td>
</tr>
<tr>
<td>15</td>
<td>Inadequate experience of consultants’ staff</td>
<td>57.0</td>
</tr>
<tr>
<td>17</td>
<td>Breakdown of equipment</td>
<td>54.7</td>
</tr>
<tr>
<td>18</td>
<td>Delays in revising and approving design documents</td>
<td>53.5</td>
</tr>
<tr>
<td>18</td>
<td>Insufficient data collection and surveys before designs</td>
<td>53.5</td>
</tr>
<tr>
<td>18</td>
<td>Mistakes and inconsistencies in design documents</td>
<td>53.5</td>
</tr>
<tr>
<td>21</td>
<td>Delays in the provision of services by utility organisations</td>
<td>52.3</td>
</tr>
<tr>
<td>22</td>
<td>Low production levels in the labour force</td>
<td>50.0</td>
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<tr>
<td>22</td>
<td>Stoppage of works due to negligence in observing health and safety</td>
<td>50.0</td>
</tr>
<tr>
<td>24</td>
<td>Unavailability of skilled equipment operators</td>
<td>47.7</td>
</tr>
<tr>
<td>24</td>
<td>Attitude of workers towards works</td>
<td>47.7</td>
</tr>
<tr>
<td>Ranking</td>
<td>Causes of Time Overruns in Road Construction Projects</td>
<td>Frequency Index (%)</td>
</tr>
<tr>
<td>--------</td>
<td>------------------------------------------------------------------------------------------</td>
<td>---------------------</td>
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<tr>
<td>24</td>
<td>Accidents during road construction</td>
<td>47.7</td>
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<tr>
<td>24</td>
<td>Inadequate safety officers on site</td>
<td>47.7</td>
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<tr>
<td>24</td>
<td>Criminal activities</td>
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<tr>
<td>29</td>
<td>Failure to use safety equipment during road construction</td>
<td>46.5</td>
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<td>30</td>
<td>Unclear and inadequate details in design drawings</td>
<td>45.3</td>
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<tr>
<td>30</td>
<td>Lack of high-technology mechanical equipment</td>
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<tr>
<td>32</td>
<td>Poor coordination during project implementation</td>
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<tr>
<td>32</td>
<td>Insecurity leading to not passing on related work experience to others</td>
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<tr>
<td>34</td>
<td>Poor qualifications of contractors' staff</td>
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<td>35</td>
<td>Ineffective and low productivity of equipment</td>
<td>41.9</td>
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<td>36</td>
<td>Use of obsolete equipment</td>
<td>40.7</td>
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<td>37</td>
<td>Inexperience on the part of the workers</td>
<td>39.5</td>
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<td>38</td>
<td>Poor communication between the client and the construction team</td>
<td>38.4</td>
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<tr>
<td>38</td>
<td>Delays in producing design documents</td>
<td>38.4</td>
</tr>
<tr>
<td>38</td>
<td>Use of inappropriate equipment</td>
<td>38.4</td>
</tr>
<tr>
<td>38</td>
<td>Effects of sub-surface and ground conditions</td>
<td>38.4</td>
</tr>
<tr>
<td>42</td>
<td>Re-works due to construction errors</td>
<td>37.2</td>
</tr>
<tr>
<td>42</td>
<td>Natural disasters</td>
<td>37.2</td>
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<tr>
<td>44</td>
<td>Delays in ordering project materials</td>
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<td>44</td>
<td>Inadequate experience on the part of contractors' staff</td>
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<td>44</td>
<td>Delays in obtaining permits from authorities</td>
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<td>44</td>
<td>Delays in certification and undertaking final inspections</td>
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<tr>
<td>48</td>
<td>Delays in delivery of project materials</td>
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<td>48</td>
<td>Death of skilled workers during road construction</td>
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<td>50</td>
<td>Unavailability of specified construction materials on local markets</td>
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<td>50</td>
<td>Lack of advanced engineering software</td>
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<tr>
<td>52</td>
<td>Poor coordination of project activities during implementation</td>
<td>32.6</td>
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<tr>
<td>Ranking</td>
<td>Causes of Time Overruns in Road Construction Projects</td>
<td>Frequency (%)</td>
</tr>
<tr>
<td>---------</td>
<td>-----------------------------------------------------</td>
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<tr>
<td>53</td>
<td>Usage of wrong equipment</td>
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<tr>
<td>53</td>
<td>Delivery of sub-standard materials to project sites</td>
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<tr>
<td>55</td>
<td>Poor coordination</td>
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<td>55</td>
<td>Material type change during construction</td>
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<tr>
<td>57</td>
<td>Conflicts amongst workers</td>
<td>27.9</td>
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<td>58</td>
<td>Poor storage facilities for project materials leading to loss of required properties, quality and consequent damage</td>
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<td>58</td>
<td>Unavailability of improved materials on the local markets</td>
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<td>60</td>
<td>Conflicts between contractors and collaborating partners (i.e consultant and client)</td>
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<td>60</td>
<td>Working in unsafe areas</td>
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<tr>
<td>62</td>
<td>Poor/improper construction methods</td>
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<tr>
<td>63</td>
<td>Delays in approving drawings</td>
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<td>63</td>
<td>Poor communication</td>
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<td>65</td>
<td>Delays in the issuance of work permits to foreign experts</td>
<td>18.6</td>
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<td>66</td>
<td>Other (labour related causes)</td>
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<td>67</td>
<td>Inadequate experience on the part of the contractor</td>
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<td>68</td>
<td>Poor communication</td>
<td>14.0</td>
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<td>69</td>
<td>Suspension of works by clients</td>
<td>12.8</td>
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<tr>
<td>69</td>
<td>Control of traffic and restrictions on project sites</td>
<td>12.8</td>
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<tr>
<td>71</td>
<td>Poor method statements</td>
<td>11.6</td>
</tr>
<tr>
<td>71</td>
<td>Changes in government regulations</td>
<td>11.6</td>
</tr>
<tr>
<td>73</td>
<td>Other (equipment related causes)</td>
<td>10.5</td>
</tr>
<tr>
<td>73</td>
<td>Ordering of wrong materials</td>
<td>10.5</td>
</tr>
<tr>
<td>75</td>
<td>Delays in approving samples</td>
<td>9.3</td>
</tr>
<tr>
<td>75</td>
<td>Delivery of wrong materials</td>
<td>9.3</td>
</tr>
<tr>
<td>77</td>
<td>Other (health and safety related causes)</td>
<td>8.1</td>
</tr>
<tr>
<td>77</td>
<td>Other (external factor related causes)</td>
<td>8.1</td>
</tr>
<tr>
<td>79</td>
<td>Other (client related causes)</td>
<td>5.8</td>
</tr>
<tr>
<td>79</td>
<td>Delays by sub-contractors in executing works</td>
<td>5.8</td>
</tr>
<tr>
<td>Ranking</td>
<td>Causes of Time Overruns in Road Construction Projects</td>
<td>Frequency Index (%)</td>
</tr>
<tr>
<td>---------</td>
<td>------------------------------------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>81</td>
<td>Damages to sorted materials whilst needed most on site</td>
<td>4.7</td>
</tr>
<tr>
<td>81</td>
<td>Other (material related causes)</td>
<td>4.7</td>
</tr>
<tr>
<td>83</td>
<td>Other (consultant related causes)</td>
<td>3.5</td>
</tr>
<tr>
<td>83</td>
<td>Other (contractor related causes)</td>
<td>3.5</td>
</tr>
<tr>
<td>85</td>
<td>Conflicts in schedule of sub-contractors during project execution</td>
<td>2.3</td>
</tr>
<tr>
<td>85</td>
<td>Frequent changes in the engagement of sub-contractors</td>
<td>2.3</td>
</tr>
</tbody>
</table>

*Source: Author (2016)*
APPENDIX 5: Questionnaire

TOPIC: An Investigation into cause, effect and measures fo minimising time overruns in Road Construction Projects in Malawi: A Case of Roads Authority

Objective of the Study

To investigate the causes, effects and measures for minimising the occurrence of schedule overruns in road construction projects in Malawi

INSTRUCTIONS

Answer the following questions by indicating in the relevant box or writing in the space provided

Example on how to complete the questionnaire

Your gender? If you are male

1. Male
2. Female

<table>
<thead>
<tr>
<th>Gender ID</th>
<th>1</th>
</tr>
</thead>
</table>

SECTION A : BACKGROUND INFORMATION OF RESPONDENTS

This section of the questionnaire seeks to gather background information, which though sensitive, will help in the comparison of various groups of respondents.

Be assured that your responses will remain anonymous.

(A) For which of the following organisations do you work for?

(1) Government
(2) Roads Authority (RA)
(3) Roads Fund Administration (RFA)
(4) National Construction Industry Council (NCIC)
(5) Consultant
(6) Contractor
(7) Other; please specify: ........................................................................................................
Please indicate the number of the organisation you work in the table below:

<table>
<thead>
<tr>
<th>Organisation ID</th>
<th></th>
</tr>
</thead>
</table>

(B) State your position in the organisation/company?

1. Director/Head of Section
2. Engineer (Client)
3. Technician (Client)
4. Technical Auditor
5. Director (Consultant)
6. Resident Engineer (Consultant)
7. Engineer (Consultant)
8. Technician (Consultant)
9. Director/Project Manager (Contractor)
10. Site Agent (Contractor)
11. Engineer (Contractor)
12. Technician (Contractor)

Please indicate the number of the organisation you work in the table below:

<table>
<thead>
<tr>
<th>Organisation Position</th>
<th></th>
</tr>
</thead>
</table>

SECTION B: TECHNICAL EXPERIENCE OF THE RESPONDENTS

This section of the questionnaire seeks to gather information on the technical experiences of the respondents in the road construction industry.

(C) Indicate the number of years you have been in the road construction industry?

1. 1 – 5
2. 6 – 10
Please indicate the category of your years of experience in the road construction industry in the table below:

<table>
<thead>
<tr>
<th>Position of Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 – 15</td>
</tr>
<tr>
<td>16 – 20</td>
</tr>
<tr>
<td>21 and above</td>
</tr>
</tbody>
</table>

(1) 1 – 2
(2) 3 – 4
(3) 5 – 6
(4) 7 – 8
(5) More than 8 projects

Please indicate the number of road construction projects you have been involved in your years of experience in the table below:

<table>
<thead>
<tr>
<th>Number of Projects Involved</th>
</tr>
</thead>
</table>

(1) 0%
(2) 1 - 25%
(3) 26 – 50%
(4) 51 – 75%
(5) 76 – 100%
Please indicate the proportion of road construction projects which were completed outside schedule in the table below:

<table>
<thead>
<tr>
<th>Projects Completed On Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

(F) Indicate the proportion of road construction projects that were completed on schedule?

1. 0%
2. 1 - 25%
3. 26 – 50%
4. 51 – 75%
5. 76 – 100%

Please indicate the proportion of road construction projects which were completed on schedule in the table below:

<table>
<thead>
<tr>
<th>Projects Completed Outside Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

(G) Please indicate the average duration of schedule overruns in the road construction projects executed in your experience?

1. None
2. 1 – 6 months
3. 7 – 12 months
4. 13 – 18 months
5. 19 – 24 months
6. 25 – 30 months
7. 31 – 36 months
8. More than 36 months

Please indicate the proportion of road construction projects which were completed on schedule in the table below:
SECTION C: CAUSES OF SCHEDULE OVERRUNS IN ROAD CONSTRUCTION PROJECTS

This section of the questionnaire explores the causes of schedule overruns in road construction projects

Objective No.: 1: To determine the causes of schedule overruns in road construction projects in Malawi

(H) Listed below are the major causes of schedule overruns in road construction projects related to Clients.

Please select the five most likely causes of schedule overruns related to clients in road construction projects in Malawi from the following list:

(a) Inadequate planning: unrealistic sources of funding and due dates for project deliverables
(b) Design changes by clients during construction
(c) Delays in revising and approving design documents
(d) Delays in approving drawings
(e) Delays in approving samples of materials
(f) Suspension of works by clients
(g) Slow decision making processes
(h) Poor communication between the client and construction team
(i) Poor coordination during project implementation
(j) Delays in processing contractors’ payment certificates
(k) Other, please specify: ..................................................................................................................
Please select **the five most likely causes of schedule overruns related to consultants** in road construction projects in Malawi from the following list:

(a) Delayed approvals for major changes in the scope of works  
(b) Delays in certifying contractors’ payment certificates  
(c) Insufficient data collection and surveys before designs  
(d) Mistakes and inconsistencies in design documents  
(e) Poor communication  
(f) Poor coordination  
(g) Inadequate experience of consultants’ staff  
(h) Delays in the production of design documents  
(i) Unclear and inadequate details in design drawings  
(j) Lack of advanced engineering software  
(k) **Other, please specify:** ..............................................................

<table>
<thead>
<tr>
<th>Ranking of Consultant Related Causes of Schedule Overruns in Road Construction Project in Malawi</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Please select and rank **the five most likely causes of schedule overruns related to contractors** in road construction projects in Malawi from the following list:

(a) Delays in mobilising to project sites  
(b) Inadequate financial capacity to finance projects  
(c) Conflicts in schedules of sub-contractors during project execution  
(d) Re-works due to construction errors
(e) Conflicts between contractors and collaborating partners (i.e. consultant & client)
(f) Poor communication
(g) Poor coordination of project activities during implementation
(h) Poor planning and scheduling of project activities
(i) Poor/Improper construction methods
(j) Delays by sub-contractors in executing works
(k) Frequent changes in the engagement of sub-contractors
(l) Poor qualifications of Contractors staff
(m) Inadequate experience of Contractors staff
(n) Inadequate experience on the part of the Contractor
(o) Poor method statements
(p) Other, please specify: ..........................................................................

<table>
<thead>
<tr>
<th>Ranking of Contractor Related Causes of Schedule Overruns in Road Construction Project in Malawi</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>-------------------------------------------------</td>
</tr>
</tbody>
</table>

Please select and rank the five most likely causes of schedule overruns related to equipment in the road construction projects in Malawi from the following list:

(a) Breakdown of equipment
(b) Unavailability of equipment
(c) Unavailability of skilled equipment operators
(d) Ineffective and low productivity of equipment
(e) Lack of high-technology mechanical equipment
(f) Use of obsolete equipment
(g) Usage of wrong equipment
(h) Other, please specify:.................................................................................................

<table>
<thead>
<tr>
<th>Ranking of Equipment Related Causes of Schedule Overruns in Road Construction Project in Malawi</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>---------------------------------</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Please select and rank the five most likely causes of schedule overruns related to materials in the road construction projects in Malawi from the following list:

(a) Unavailability of specified construction materials on local markets
(b) Material type change during construction
(c) Damages to sorted materials whilst needed most
(d) Fluctuation of material prices
(e) Delays in ordering project materials
(f) Ordering of wrong project materials
(g) Delivery of wrong project materials to sites
(h) Delays in delivery of project materials
(i) Delivery of sub-standard materials to project sites
(j) Poor storage facilities for project materials leading to loss of required properties, quality and consequent damage
(k) Other, please specify:.................................................................................................

<table>
<thead>
<tr>
<th>Ranking of Material Related Causes of Schedule Overruns in Road Construction Project in Malawi</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>---------------------------------</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

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Please select and rank the five most likely causes of schedule overruns related to labour in the road construction projects in Malawi from the following list:

(a) Unavailability of qualified workforce
(b) Delays in the issuance of work permits for foreign experts
(c) Low production levels in the labour force
(d) Attitude of workers towards work
(e) Conflicts amongst workers
(f) Inexperience on the part of workers
(g) Insecurity leading to not passing on related work experience to others
(h) Other, please specify:............................................................

| Ranking of Labour Related Causes of Schedule Overruns in Road Construction Project in Malawi |
|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|
| 1                                             | 2                                             | 3                                             | 4                                             | 5                                             |

Please select and rank the five most likely causes of schedule overruns related to health in the road construction projects in Malawi from the following list:

(a) Accidents during road construction
(b) Death of skilled and unskilled workers during road construction
(c) Stoppage of works due to negligence in observing health and safety regulations
(d) Working in unsafe areas
(e) Inadequate safety officers on site
(f) Failure to use safety equipment during road construction
(g) Use of inappropriate equipment
(h) Workers risky behaviour
(i) **Other, please specify:**

<table>
<thead>
<tr>
<th>Ranking of Health Related Causes of Schedule Overruns in Road Construction Project in Malawi</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

*Please select and rank the five most likely causes of schedule overruns related to external factors in the road construction projects in Malawi from the following list:*

(a) Effects of subsurface and ground conditions  
(b) Delays in obtaining permits from authorities  
(c) Effects of weather on road construction works  
(d) Changes in government regulations  
(e) Control of traffic and restrictions on project sites  
(f) Delays in the provision of services by utilities  
(g) Delays in certification and undertaking final inspections  
(h) Political interference  
(i) Natural disasters  
(j) Criminal activities  
(k) **Other, please specify:**

<table>
<thead>
<tr>
<th>Ranking of External Factors Related Causes of Schedule Overruns in Road Construction Project in Malawi</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

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SECTION D: EFFECTS OF SCHEDULE OVERRUNS IN ROAD CONSTRUCTION PROJECTS

This section of the questionnaire explores the effects of schedule overruns in road construction projects

Objective No.: 2: To analyse the effects of schedule overruns in road construction projects in Malawi

(I) Listed below are the effects of schedule overruns in road construction projects.

Please select the five likely effects of schedule overruns in road construction projects in Malawi and rank them from 1 (most effective) to 5 (least effective)

(a) Cost overruns
(b) Extension of the performance period
(c) Disputes between contract parties
(d) Arbitration
(e) Project abandonment
(f) Litigation
(g) Claims
(h) Termination of the contract
(i) Loss of profits
(j) Loss of employees
(k) Negative social impact
(l) Idling of resources
(m) Delaying of the client in repaying back loans
(n) Poor quality of works due to hurried execution of works
(o) Delaying clients in getting profits from the projects
(p) Bankruptcy on the part of the client
(q) Creation of stress on the project team
(r) Other, please specify:........................................................................................................

Ranking of the Effects of Schedule Overruns in Road Construction Project in Malawi
SECTION E: MEASURES FOR MINIMISING THE OCCURRENCE OF SCHEDULE OVERRUNS IN ROAD CONSTRUCTION PROJECTS

This section of the questionnaire explores the effects of schedule overruns in road construction projects.

Objective No.: 3: To recommend measures which can minimise the occurrence of schedule overruns in road construction projects in Malawi.

(J) Listed below are the effects of schedule overruns in road construction projects. Please select the five likely measures which can minimise the occurrence of schedule overruns in road construction projects in Malawi and rank them from 1 (most effective) to 5 (least effective).

(a) Effective and efficient management of project sites and supervision works.
(b) Effective strategic planning.
(c) Proper project planning and scheduling.
(d) Coordination between the construction team.
(e) Complete and proper designs at the project commencement.
(f) Employing appropriate construction methods.
(g) Use of accurate cost estimates when formulating tender documents.
(h) Constructing according to issued drawings.
(i) Use of proper and modern equipment.
(j) Use of proper methods in procuring construction materials.
(k) Adherence to construction specifications.
(l) Conducting frequent progress meetings.
(m) Establishing clear communication channels.
(n) Fast-tracking construction works.
(o) Use of up to date technology.
(p) Collaborative working spirit by the construction team

(q) Other, please specify:...........................................................................................................

| Ranking of the Effects of Schedule Overruns in Road Construction Project in Malawi |
|---------------------------------|---|---|---|---|---|
| 1                               | 2 | 3 | 4 | 5 |

THANK YOU VERY MUCH FOR YOUR TIME