Department of Civil Engineering

EVALUATING FACTORS CAUSING TIME AND COST OVERRUNS IN ROAD PROJECTS IN ROADS DEPARTMENT, BOTSWANA

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APPROVAL PAGE

This research has been examined and is approved as meeting the required standards of the scholarship for partial fulfillment of the requirements for the Master's Degree in Project Management,

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STATEMENT OF ORIGINALITY AND DISCLAIMER

This dissertation was completed by the author at the University of Botswana in 2016. It is original work where due reference is made and neither has been nor will be submitted for the award of any other university.

Signed:

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Palesa Mokote

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ABSTRACT

Successful performance in a construction projects help to deliver a good product to the client. Poor time and cost performance on projects has become the key concern in Roads Department, Botswana. This is evidenced by records from some previous projects implemented between 1999 to 2013 which incurred time and cost overruns resulting in poor project delivery. This research has mainly been devoted to evaluating factors causing time and cost overruns in the execution of the projects. Secondary data was obtained from the literature review which provided the researcher with time and cost factors to use in evaluating the situation in Roads Departments, Botswana. A structured questionnaire was given to 38 officers (15 comprising top management and project managers, 17 project officers and 6 officers in the project team) from Project Implementing Unit; Their responses were evaluated to establish the extend in which the factors were occurring as well as their severity, the higher the occurrence, the more severe the factor. There were nineteen time factors and eleven cost factors identified, some from previous researches and some were brought up by the researcher. Non statistical analysis was used, which was the ranking of the factors on the frequency of their occurrence from respondents. Only those factors ranking 55% and above were found to be significant and severe. Statistical data analysis was applied using SPSS software package to determine the pattern of relationship on time and cost factors. Techniques used were Exploratory Factor Analysis through the factor extraction technique, The Kaiser-Meyer-Olkin & the Bartlett's Test of Sphericity technique, Regression Coefficient, Analysis of Variance (ANOVA) and Pearson Correlation Coefficient. The findings depicted that six time factors and four cost factors were found significant and severe as they rated beyond 55%. It was again found out that there is a strong relationship between time and cost in achieving high or low project performance; four time factors were found most predictable to cost performance, while two cost factors were found most predictable factors to time performance. The mitigation measures have been given to ensure acceptable time and cost performance on project implementation. The study has given recommendations on the time and cost factors that were found severe and impacting projects negatively. These mitigations and the recommendations would assist the project team towards expected performance on output and delivery.

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LIST OF ABBREVIATIONS

BHC	-	Botswana Housing Corporation
BPC	-	Botswana Power Corporation
BR	-	Botswana Railways
BTC	-	Botswana Telecommunications Corporation
CI	-	Construction Industry
GDP	-	Gross Domestic Product
NDP	-	National Development Plan
PIU	-	Project Implementing Unit
PM	-	Project Management
PMBOK	-	Project Management Book of Knowledge
RD	-	Roads Department
WUC	-	Water Utilities Corporation

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CHAPTER ONE: INTRODUCTION

1.1 Overview on Time and Cost Performance in Project Management

Time and cost overruns are a global phenomenon in the construction industry where very rarely projects are finished within the budgeted cost and stipulated time. Flyvbjerg *et al* (2003), commented that in construction project performance, cost overrun was identified to be the major problem where 9 out of 10 projects faced the overrun in the range of 50 – 100%. Similarly Rahman *et al* (2013), noted that time and cost overruns have become a serious concern to investors and therefore need urgent attention and in-depth research for solutions.

Memon *et al* (2012), believed that time and cost performance is the fundamental criterion for success of any project. As a result, in the construction industry, the aim of the project control is to ensure that projects finish on time, within budget and achieve other project objectives. A successful project is the one that has accomplished its technical performance, maintained it schedule and remained within budgeted cost and stipulated time. Project management tools and techniques play an important role in the effective management of projects. Construction time and cost are fundamental considerations in project management and regarded as most important parameters for measuring success of any project. Poor performance of time and cost can lead to a significant amount of time and cost overrun.

Idrus *et al* (2011), mentioned that in every construction project, project management cannot succeed unless the project manager is willing to employ an effective approach to project management by analysing those variables such as time, cost and quality that lead to success or failure in a project. Today project performance is being developed in many ways as criterion for evaluating the success of a project. Successful performance in a construction project helps to deliver good products to the clients. Construction time and cost are the criteria given high priority by clients in measuring the performance of a construction project.

1.2 The Construction Industry

Al-Tabtabai (1996), commented that the construction industry is a highly dynamic sector and plays an important role in the development of a country. The nature of the construction industry is to be profitable in extremely competitive environment. On the other hand,

construction projects are notorious of running over time and budget. This ever changing status of the construction industry result in uncertain variables in project data which can give rise to significant negative impacts resulting in low productivity, cost and time overruns conflicts and disputes, and resulting in claims and time-consuming litigation. As a consequence, Project Managers are faced with performance problems in determining the accurate project performance direction to take, resulting in deficiencies in monitoring and controlling projects effectively, hence major causes of project failure.

Brown (1996), opined that construction projects typically involve multiple parties performing their specialized functions in a coordinated effort, which sometimes leads to opportunities for issues to impact the completion of a project. In other cases, projects are impacted by unforeseen conditions discovered during the course of construction and these result in project delays. When project is delayed, all parties involved experience some impact whether it can be measured through cost or not.

1.3 Overview of the Construction Industry in Botswana

Kariuki *et al* (2014), observed that Botswana's economic performance improved in 2013, continuing to recover from the 2008/09 global economic crisis. Real GDP growth is projected to increase after 2013, mainly driven by service-oriented sectors, especially trade, transport and communications, public and financial services. The country's main sector mining, recorded a recovery in spite of the impact of the sluggish global forecasts. These optimistic increases were, however, somehow countered by water deficiencies and electricity outages arising from drought. The thorough performance of the non-mining sectors is admirable as it provides promising steps towards economic divergence. Short term forecasts are strong with economic growth anticipated to persist at around 5% per annum through to 2015, mostly premised on downstream manufacturing.

The table below shows Gross Domestic Product (GDP) which was derived from Statistics Botswana, 2015. It is also shows the breakdown of the GDP per sector and the projected 2015 GDP per sector. Table1 below is showing the contribution of construction industry in GDP.

In the mid-nineties NDP 8 informed that this industry used to be one of the major sectors that provide employment and contributes an average of 5% to the Country's GDP but fluctuations

in construction demand affects the economy in many ways, such as, affecting the demand for the resources as well as the delay in supplying the industry's product.

Table 1: Gross Domestic Product by Type of Economic Activity (Current Prices in Percentage of Totals)

Period	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Av. Dev.	Projected 2015
Agriculture	2.3%	1.8	2.0	2.2	2.5	2.9	2.9	2.5	2.7	2.3	0.29	2.59
Mining	25.7%	31.7	32.2	29.1	26.1	13.9	24.5	24.7	19.9	22.4	3.94	26.34
Manufacturing	5.6%	4.9	5.3	6.3	5.6	6.4	5.9	5.8	5.9	5.2	0.37	5.57
Water & Electricity	1.9%	1.4	1.3	1.1	0.9	0.4	0.4	0.2	-0.2	-0.2	0.60	-0.20
Construction	5.7%	4.8	4.8	5.3	4.9	6.2	5.4	6.0	6.7	6.3	0.57	6.87
Trade, Hotels & Restaurants	12.2%	10.8	11.9	12.3	13.2	15.4	14.0	14.7	15.3	15.0	1.39	16.39
Hotels & Restaurants	3.0%	2.8	4.0	4.4	4.8	5.6	5.4	5.8	5.9	5.7	0.95	6.65
Transport, Post & Telecommunication	3.4%	3.6	3.8	4.0	4.4	5.5	4.8	4.9	5.6	5.5	0.71	6.21
Banks, Insurance & Business Services	12.7%	11.7	11.3	11.4	12.3	13.4	12.4	12.9	14.5	13.9	0.83	14.73
General Government	14.6%	14.2%	13.2	13.2	14.4	17.0	14.3	13.8	15.0	14.8	0.72	15.52
Social & Personal Services	5.0%	5.0%	5.0	4.8	5.1	6.4	5.6	5.6	6.2	6.1	0.50	6.60

(Source: Statistics Botswana, 2015)

The major client in the construction industry is the government through its ministries and various government institutions. Others include public corporations such as the Botswana Housing Corporation (BHC), Botswana Power Corporation (BPC), Botswana Railways (BR), Botswana Telecommunications Corporation (BTC), Debswana, Water Utilities Corporation (WUC) and a number of private organizations.

Government projects are coordinated by their relevant Departments and Ministries, depending on the project involved. Roads Department, in the Ministry of Transport and Communications coordinates construction and maintenance of roads and bridges in Botswana. The Department could use in-house staff for execution of works as well as outsourcing works or assign those works to consulting firms, local or international.

The NDP 7 reported that favourable Government policy for the last decade has seen Botswana's construction sector grow from obscurity into a vibrant industry supporting a sizeable establishment of contractors, consultants, manufacturers and labour, in spite of Botswana's small population. This industry is being dominated by foreign companies who in the case of contractors, have edged out the local competitors where possible into nothing more than sub-partners. However, this setback is offset by benefits such as job creation, direct foreign investment, technology and skills transfer. The significance of the industry to the nation was underscored by the then Minister of Works, Transport and Communications, in 2000 on the Second International Conference of the Construction Industry, when he reported that the Botswana construction industry occupied a special place in the economy of the country as it provided employment to many Batswana.

The plan (NDP 7) continued to state that if national policies succeed in establishing the economy, they would stabilise demand for the construction industry directly. This would explain the construction boom that was experienced in the mid-eighties and early nineties in Botswana where the country enjoyed the fastest growing economy which was fuelled by a sharp demand for diamonds in the world market. Gaborone, the capital city of Botswana, by then became one of the most rapidly expanding cities in the developing countries in terms of population and size. People from rural areas migrated to the city in search for better living while foreigners also flocked into Botswana for economic opportunities. This forced the government to launch huge projects to sustain the social and economic demands of the time such as the construction of new roads and houses for ease of habitation.

Extensive basic infrastructure has been provided, implying that Botswana has been improving and developing gradually. That is why National Development Plans (NDPs) 7 & 8 emphasised that infrastructure was found particularly vital for sustainable development of countries like Botswana; given its large area, unevenly distributed population and land locked nature. In addition to the mentioned characteristics, the sandy terrain, semi-arid climate, topographical conditions (flat land but high drainage requirements) and the shortage of

construction materials, had proved infrastructure to have been found relatively expensive in terms of per capita expenditure on development and maintenance than on most other countries. The plans pointed out that a balanced and efficient infrastructure is an important catalyst for economic development. Government had since independence emphasised its facilitative role through the development of this infrastructure and has accorded it priority. Currently, public works are going through a stabilised pace despite community development demand that increases with time, but would be expected to remain at this stable level over the next couple of years.

The government's construction plans have been well thought out in terms of Botswana's long-term development. NDP7 has showed that this industry was found to be one of the largest employers in the country. Through strategic use of the revenues, the government has successfully been putting money into the community, and continuing to develop an increasingly sophisticated infrastructure at the same time.

1.4 Challenges faced by Botswana's Construction Industry

During the three years of construction boom 1986–1989, NDP 7 & 8 reported that there was re-emergence of the so-called fly-by-night contractors who, according to some of the long-term resident companies were out to make quick money. The general complaint from the existing contractors was that the new comers did not have the overheads of the long-term players including the accrued severance benefits and investment in infrastructure. New big contractors were also blamed for not developing the locals, and taking money out of the country instead of putting it back into the local economy. In addition, these new competitors have been accused of putting in unrealistic tenders in terms of the price and time quoted for contract completion. After they have been awarded the contract, many have been unable to meet their deadlines.

After the construction boom, of the mid to late 80s, the industry went through a severe downsizing, partly because of excessive capacity expansion in the late eighties to late nineties. Many companies over expanded and took on more than their capacity could carry resulting in cash flow crisis. Citizen contractors were particularly affected most where the government reviewed the scheme of training them for assistance but little improvement was found.

The construction industry in Botswana is a very competitive and high-risk business. It is also faced with many problems such as little co-operation, limited trust, incompetent practitioners and ineffective communication resulting in an adversarial relationship among all project stakeholders. This kind of relationship is reflected in project delays, difficulty in resolving claims, cost overruns, litigation, and a win–lose climate. This was evidenced from *Daily news newspaper of 14th February, 2007,* where one of the Parliamentarians raised his concern on the cost overruns on projects that are being carried out in the country. He further commented that poor implementation of projects is bad for the economy as it often results in cost overruns.

Ngowi & Ssegawa (2007), stated that Botswana's construction industry is accepting use of modern management methods at a slow pace, whereas these methods would assist in better planning and implementation of projects professionally and to the customers' satisfaction. This has given rise to the industry being criticised, to a large extend by the stakeholders and the product end users. This failure could result in delays in project schedules, cost and time overruns that had plagued the industry badly. Because this industry is not essentially well regulated, coordinated and rigorously monitored, it is still struggling to achieve projects that would be efficiently and effectively managed and fail to achieve the interests of the end users. The inputs among many that could be found significant in Botswana's construction industry are effective management, personnel and resources.

They went on to say that successful handling of construction projects in Botswana has become a challenge for clients, project managers and consultants, architects and engineers and contractors. Cost and time driven developments in the construction industry, fragmented supply chains and construction processes and lowest-price tendering have led to the weakest performance in this business for years. Budget and time overruns along with a vastly growing number of supplement claims and poorer building quality is the result of these tendencies. This is partially due to the fact that design and construction processes have become hardly manageable. These imply that construction projects are dominated by tension, lack of co-operation and collaboration among the participants and by adversarial relationships. In this era of conflict, companies are struggling to survive the pressure of competition and this victimises the public sector as it relies on these companies for effective project delivery.

1.5 Background of Roads Department in Botswana

The Roads Department of the Ministry of Transport and Communications is responsible for the construction and maintenance of Public Highway Network (PHN) including bridges. The growth in the PHN has been a great success as it started with 6km of tarred road in 1966 and to date (2015) PHN consists of approximately 20,208km of which 7,892km is tarred.

According to NDP 9 Botswana has over 18,000km of roads and tracks whereby PHN covered 8,700km with 3970km that was bituminised. Local Authority became responsible through their Town and District Councils, for the implementation of all roads within the villages, towns and cities.

Within NDP 8 a large road construction was planned and this resulted in an increased paved road network from around 5,500km to 7,500km. Most of these were to be considered secondary and access roads and they were found suitable being constructed using labour based methods.

The Department provides road network to link all population centres, cities, towns and neighbouring countries (see Appendix A: 2011 Map of Botswana showing Roads Infrastructure under Roads Department). The projects that are being carried out in the Department reflect the Government's goal of establishing a bitumen road network spanning the entire Country linking all District centres.

1.5.1 Function and Responsibilities of the Department

To improve the road communication throughout the country the Department has set out to do the following:

a) Serve as the focal point for policy and operational direction and co-ordination of all relevant activities pertaining to road design, construction and maintenance.
b) Plan, survey and design a balanced national road network including bridges.
c) Construct and maintain all national roads.
d) Institute and implement proper axle load control measures to protect national roads and bridges from rapid deterioration.
e) Administer the relevant provision of the Public Roads Act.
f) Avail the Roads Departments professional and technical services to the local authorities as an advisory role as and when necessary.

1.5.2 Funding in Roads Department

The financial perspective in the execution of road infrastructure in the Department was categorised into the following:

a) There are routine maintenance works that are taken care of by government recurrent budget. These works include pothole patching, dry grading, bush clearing and grass cutting of the road reserve, fence repairing and spot improvement.

b) There are also projects that are carried out as periodic maintenance works which are also taken care of by recurrent budget. These works include road resealing, fog spraying and shoulder widening.

c) Roads Department has the fund called Fuel levy that is obtained from the charge incorporated in the fuelling of vehicles countrywide. This fund takes care of the emergency projects and the critical periodic maintenance projects that might not had been covered in the recurrent budget.

d) There are Development projects; these are the projects that are new construction (it could be a road or a bridge) and in the case of the road, that could be improved from gravel to being tarred or just a new construction of the road to add in the network, whereas in the case of the bridge it could be that it is a new bridge or reconstruction of the existing to required standard.

e) There are projects funded by foreign donors; at the moment, World Bank.

f) There is also technical assistance on various area of the Department that is being offered by Norway through Norwegian Public Road Authority (NPRA). Assistance includes e.g. updating of the Botswana Road Maintenance Manual, Drainage works, Bridges, Hydrology.

1.5.3 The Structure of the Department

The Department's structure consists of the Director of Roads who is the Head of the Department. The Director is succeeded by two Deputy Directors of Roads, one for Development Works (which includes design works, contract administration works, bridges works and new projects) and the Training Centre and the other one being for Maintenance and Materials Division.

The hierarchy continues to the Chief Roads Engineers, Principal Roads Engineers, Senior Roads Engineers and Roads Engineers. There is a wing of technical officers that is led by the Works Superintended, then Chief Technical Officers, Principal Technical Officers, Senior Technical Officers, Technical Officers and Technical Assistants who are responsible for supervising the gangs or units at the maintenance works. The organogram below is as derived by the researcher:

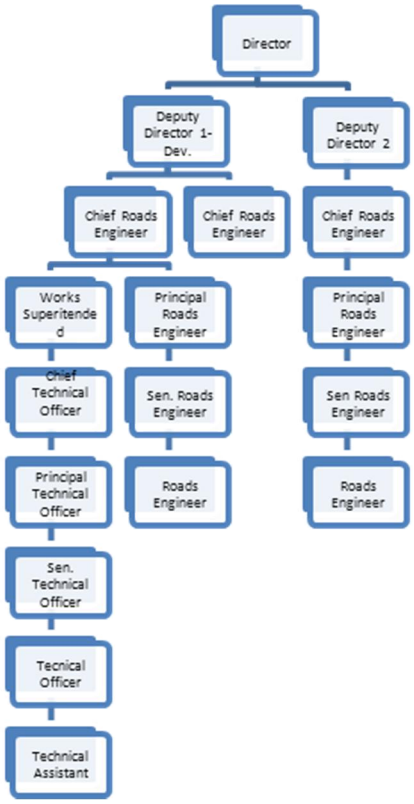

Figure 1: The organogram (Source: The Researcher)

1.5.4 Procurement System within Roads Department

Abdul R. *et al* (2006), observed that project procurement is an organized process or procedure for client to obtain or acquire construction products. It is the degree of achievement of certain effort or undertaking which relates to prescribed goals and objectives of project parameter.

Rwelamila & Ngowi (1996), noted that a survey of construction projects in Botswana revealed that the Traditional Procurement System (TPS) or its hybrids are the one employed in the majority of both public and private projects. There has been very little change in procurement practices in Botswana since the colonial days. It is purported that the dominant

Construction Procurement System (CPS) in the Botswana public building and construction sector is the Conventional or Traditional Construction Procurement System (TCPS), whereby RD is one of them. It follows a strictly sequential path of four phases: preparation, design, preparing and obtaining tenders and construction. Briefly, the construction project organization structure of this system is characterized by the appointment of a principal adviser, the design consultant, who leads the design team (the team may include structural, geotechnical engineers, land surveyors, etc.) which is assembled at his or her recommendation. The construction project is designed and detailed up to a point where the various elements of the design can be taken-off and worked up into a bill of quantities or a schedule of rates.

Rwelamila & Ngowi (1996), continued to say that at this stage, the construction contractor is invited to bid for the work and, if successful, is awarded the contract, expected to start on site within a few days. It should be noted that some contractors pay little attention to familiarizing themselves with the tender because the main objective at that time would be to win a tender and get the contract. It would be after this stage that one would begin to draw closer to the document to get to understand it better and acquaint themselves with the client. This project organization structure is normally formulated parallel with a standard project contract between the client and the contractor. The contract defines what is to be constructed, the roles of the various parties concerned and the terms of the bargain between them. In so doing, it provides the framework of parameters balancing system. It specifies the client's requirements, it stipulates the measures to be taken to assure compliance and it states the remedies available to each party in the event of default. The design consultant would also supervise the project during the construction period on behalf of the client.

This procurement scenario is brought forth to show that the Client does not carry out all the project management works as the Consultant is procured to ensure full technical and construction management operations. The Client ensures that effective project management is maintained throughout the project execution period for successful product.

1.5.5 Projects Performance in Roads Department

Performance on time and cost on roads projects in the Roads Department was obtained from the information given in Appendix C which shows time and cost history on projects implemented between 1999 and 2012. The appended information is summarised on table 1 below which illustrates time and cost overruns incurred in 48 projects that were ear marked.

The left side of Table 2 below shows the information on time overruns while the right side shows the cost overruns incurred on the same projects.

Table 2: Overview on Time and Cost Performance on Road Projects in Roads Department

No. of projects	**Time Overruns in months**	**No. of projects**	**Cost Overruns in Pula (in millions)**
3	Those completed early or as planned	25	Those that incurred a saving or zero pula overrun
18	1 – 5	8	1 – 5
14	6 – 10	3	6 – 10
4	11 – 15	5	11 – 15
5	16 – 20	2	16 – 20
3	21 – 25	1	21 – 25
1	26 – 30	2	26 – 30
1	30 and above	3	30 and above
48		**48**	

The table above shows that in 48 projects, 6% was completed without time overruns while 37% was completed without cost overruns. These percentages show that road projects are incurring time and cost overruns in a significant way; hence this study seeks to establish the cause of poor performance on time and cost on road projects.

1.6 Problem Statement

When a project exceeds its stipulated time, there are always some financial implications that are incurred. A delayed project means that there has been more time spend on the project than planned and also imply that there is going to be more overheads encountered.

Idrus *et al (*2011), stated that maintaining steady time and cost projection on road projects is an issue of serious concern. In the context of public projects; road projects are constructed for use by the public and they expect that they be executed without compromising time and cost performance. Time and cost are the components of project management. PM tools and techniques have been found vital and when used properly and professionally are economical in all the phases of project execution whereby roads projects would also benefit. They were formulated with good intentions to improve the performance on project execution and delivery. In every construction project, project management cannot succeed unless the project

manager is willing to employ an effective approach to project management by analyzing those variables that lead to success and failure in a project.

According to Appendix C, projects in the Roads Department are incurring time and cost overruns. There could be many reasons for this, for example, no proper managing, planning and monitoring of the projects, insufficient utilisation of project management procedures and modern systems that would enable the projects to be delivered within time, budget and scope good quality. This failure would result in compromised quality of the product, time and cost overruns; hence the need to carry out this study.

1.7 Research Aim

The aim of the study is to evaluate factors impacting negatively on time and cost performance on road projects in RD, thus leading to time and cost overruns. The study aims at bringing up the mitigation measures for effective time and cost performance on road projects.

1.8 Research Objectives

The study's specific objectives are:

1. To identify the causes leading to time and cost overruns in road projects in Roads Department.
2. To rank these causes in order of their severity and significance.
3. To explore the mitigation measures for successful time and cost performance in road projects.

1.9 Research Question

What should be done to improve time and cost performance in roads projects in the Roads Department?

1.10 Scope of the Research

The scope of this research is limited to time and cost performance specifically on road projects in the Roads Department, Botswana. This is so because the Ministry of Local Government has a Roads Division that also executes road projects in Villages, Towns and Cities through their respective Councils. As a result, this study focuses only on the technical staff in the Department that is obliged to take cognisance of time and cost performance in project implementation.

1.11 Significance of the study

Several studies have been conducted regarding time and cost management of projects in Botswana. However, no study has specifically been carried out to evaluate the performance of road projects in the Roads Department with regard to time and cost. This study is being carried out to specifically evaluate time and cost performance of road projects in the Department. One researcher studied the delay factors in the Department, by focusing on the key players executing road projects; the client, the consultants and the contractors. On this current study the researcher acknowledges that the client is not the only player in the project implementation to contribute in causing time and cost overruns, but is focusing on the client's input alone.

This study is aimed at improving the performance on road projects and their delivery. Its findings are intended to guide the client's technical staff on ensuring that projects are completed within stipulated time and budget. Additionally, this study will assist not only effective project delivery on roads projects in the Department, but would be of importance to other organisations carrying out similar work by establishing good approaches on project performance towards good value for money and time.

1.12 Limitations

In order to closely establish projects performance with regard to time and cost, the research focuses on RD projects constructed between 1999 to 2012.

1.13 Structure of the Research Paper

This research is presented in five chapters. The first chapter is the introductory part, which comprises the background of the study. Literature review is covered in chapter two. Chapter three covers the method of carrying out the study. Data analysis and discussion of results are results presented in chapter four and finally, mitigation measures, conclusion and recommendations form chapter five.

CHAPTER TWO: LITERATURE SURVEY

2.1 Introduction

This chapter explores several research findings, which are relevant to the subject under discussion. The review would look intensively on the past experience with regard to project management in relation to time and cost performance of the construction projects. This review would assist in identifying the causes of time and cost overruns from past experiences. Roberts (2007), stated that proper usage of project management tools and techniques eliminate obstacles to proper implementations of projects, thus providing the benefits on the project outcomes. PM is more effective in an environment that supports the management of risks because this gives the organisation greater control over its fortunes.

Time and cost overruns are quite common in many countries. A number of studies conducted worldwide have indicated that project delays and cost overruns in construction projects are still a global phenomenon. There are many causes of time and cost overruns and many studies have been carried out to determine or identify some of these. Most of the studies conducted on time and cost performance focused on building constructions. This study is aiming at identifying the factors that cause the road projects to fail due to poor time and cost performance.

2.2 Good Project Management Practices

Successfully implemented project management practice means that its nine knowledge areas have been successfully and properly adhered to in order to yield good results and within these nine areas, time and cost are included. PMBOK, (2006) explained these areas as given below:

2.2.1 Project Integration Management

Integration would include the processes and activities needed to identify, define, combine, unify and coordinate the various processes and project management activities that are crucial to project completion, successfully meeting customer and other stakeholder requirements and managing expectations.

2.2.2 Project Scope Management

Project scope management would cover the processes required to ensure that the project includes all the work required and only the work required to complete the project successfully. It is also concerned with defining and controlling what is and what is not included in the project. The boundary definitions of given tasks, responsibilities and missions

2.2.3 Project Time Management

Sambasivan and Soon (2006), argued that project time management takes close attention to the processes required to accomplish timely completion of the project. The start to finish is the project's characteristic. It should be recalled that among other characteristics of a project is that it should have a start and finish time, implying that a project should be carried out within a stipulated time frame. For this to happen, actual progress has to match or beat the planned progress. Any project that fails to keep to its planned completion time would be liable to incur time and associated cost overruns.

2.2.4 Project Cost Management

Sambasivan and Soon (2006), stated that project cost management would cover the processes involved in planning, estimating, budgeting and controlling costs so that the project can be completed within the approved budget. These costs include materials, labour and financing. Failure to achieve project budgeted cost, targeted time and specified quality would give rise to unexpected problems such as additional time and costs. At commercial or industrial projects, this failure would also result in reduced profit and any expected return on capital invested. On the other hand, there are projects that are not profit motivated, but even on the absence of profit, careful attention should be paid towards cost budget and financial management of the project.

2.2.5 Project Quality Management

The project quality management would take care of all the activities of the performing organisation that determine quality policies, objectives and responsibility so that the project would satisfy the needs for which it was undertaken. This involves the standards of measuring project performance.

2.2.6 Project Human Resource Management

Project human resource management would entail the processes that organise and manage the project team. The project management team would be responsible for project management activities such as planning, controlling and monitoring up to project closure. This is the administration and bureaucracy, manpower allocation and motivational management.

2.2.7 Project Communication Management

Project communication management would employ the processes required to ensure timely and appropriate generation, collection, distribution, storage, retrieval and ultimate disposition of project information.

Fryer (2004), commented that poor communication has long been problem in project management. Part of the trouble is the way the industry is organised. The project team is made up of people from many different firms. Their contributions vary and a lot of information has to pass among them. This requires a well organised network of communication. Even when this network exists, communication still breaks down at a personal level, because people fail to keep their message simple; they pass on too much information or too little or the information they give is inaccurate or misleading.

The effective management of information becomes vital in the construction project; this would include managing documentation and its information flow generated in a project.

2.2.8 Project Risk Management

Project risk management would include the processes concerned with risk management planning, identification, analysis, responses and monitoring and control on the project. It also considers the technological, market fluctuation and managerial risks, most of which are updated throughout the project.

Roberts (2007), suggested that project management has something to do with identifying and managing the risks that the project might encounter. It is more effective in an environment that supports the management of risks because this gives the organisation greater control over its fortunes. Effective project management, like any other form of governance, brings with it the necessary element of administration needed to control the project. This could pose a challenge through those who object to the introduction of a new way of working, procedures, routines, and regulations. Care should be taken that the administrative measures are not

stifling and are light enough to ensure that the right decisions are made by the right people at the right time, and their value is generally understood.

2.2.9 Project Procurement Management

Project procurement management would take recognition of the processes to purchase or acquire the products, services or results needed from outside the project team to perform the work. On the other hand the objectives of any project could be perceived as follows:

Quality – The end result of the project must be fit for the purpose for which it was intended. The project specifications should be satisfying.

Budget – The project should be completed without exceeding the authorised and planned expenditure. This would not mean that the project must be profitable. Many projects, especially public oriented projects, are undertaken without any profit motive, but should still satisfy the budget requirement.

Time – Actual project progress should match planned progress so that final hand over to the customer would take place no later than the specified date. If the project would be running late, it would be certain that the cost would overrun the budget. Conversely, if the work would be carefully progressed against a sensible plan, much of the cost control battle would be already won.

Perceived need – A project with a development agenda should meet the needs for which it was conceived. It should satisfy the aspirations of all stakeholders and should present an improvement on the existing condition. It should aid the development effort on a sustainable basis.

Environment – Venter (2005), explained that it has increasingly been required of planners and implementers that the end product of projects, apart from meeting technical performance and design characteristics, must also meet environmental parameters. Thus, the project should be environmentally sustainable and its presence should not be seen to have disturbed the ecological balance.

2.3 Construction Project's Life Cycle Phases

Figure 2 below, illustrates how project management can be regarded as a conversion process, which uses resources and knowledge to change a need into a deliverable product created within the defined conditions.

Projects are unique undertakings and organisations performing them will usually divide each project into several project phases to provide better management control and appropriate link to the on-going operations of the performing organisation. Collectively, the project phases are known as the project life cycle (*PMBOK, 1999*)

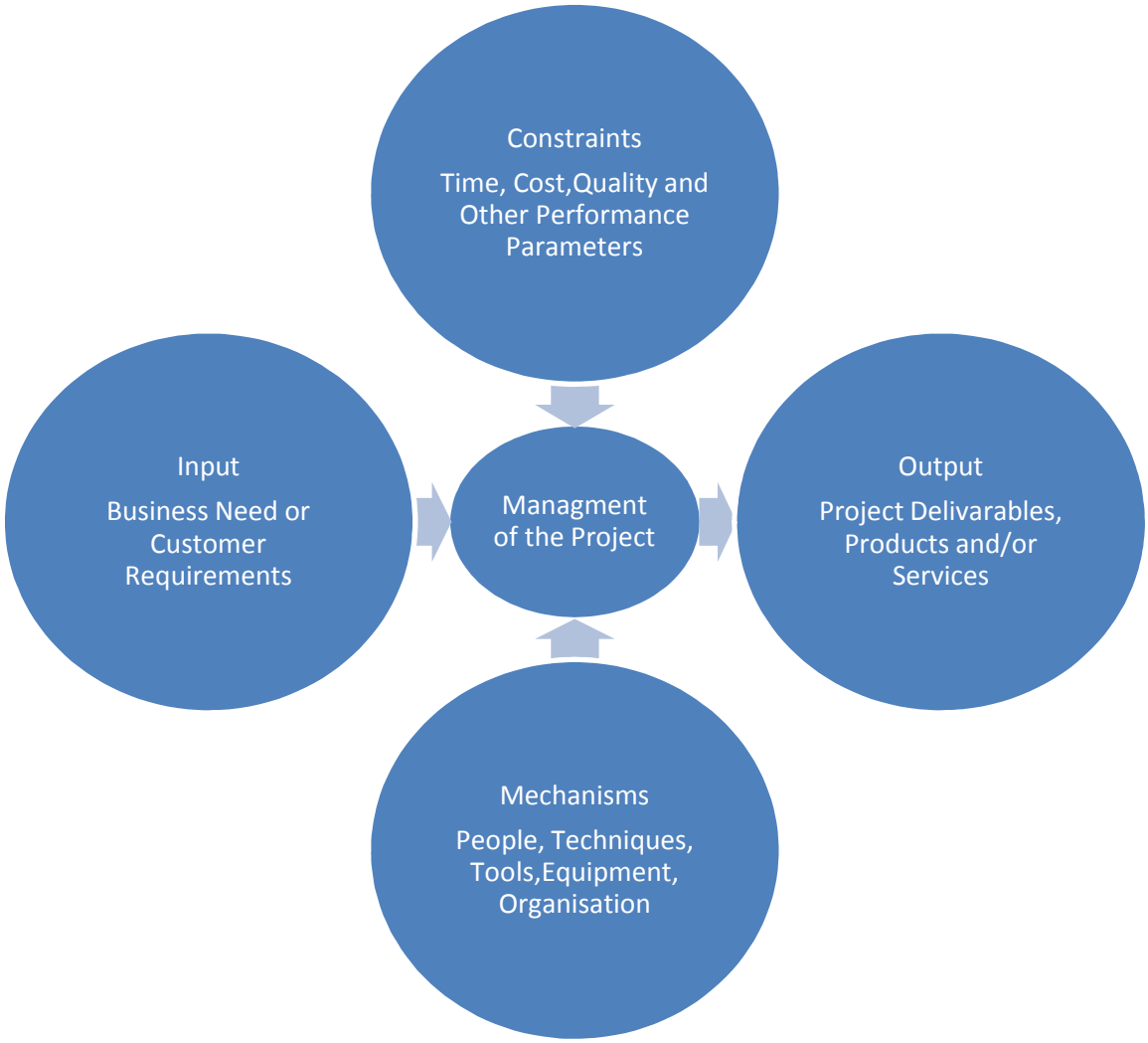

Figure 2: The Project Management Process (from Webb, 2003, pg51)

2.4 Project Performance and Project Management

Latham (1994) and Egan (1998), pointed out that a successful project relies on mutual integrity, cooperation, communication, fairness, objectivity, courtesy and professionalism. In many countries, the construction industry has, over a long period, attracted criticism for its relationships with conflicts and disputes, poor collaboration, lack of customer focus and end-user involvement. These input factors led directly to inefficiencies in outcomes such as time and cost overruns, low productivity, poor quality and customer dissatisfaction. Practitioners, researchers and society at large have, therefore, called for a change in attitudes, behaviour and procedures in order to increase the chances of project success and an improved end product.

Roberts (2007), suggested that if a change in the way an organisation achieves successful project outcomes is to be considered, it should be seen as a culture change involving adjustments in mind set, values and behavior as well as abandoning norms and vows. Experience demonstrates that effective project management requires proper collaboration of stakeholders such as those who build it and those who will be using the end product. Effective project management causes the organisation to take it as an opportunity to improve the way it manages its business. This is to say that just as the business can benefit from a well-managed project, so can it be damaged and ultimately lost if it fails. The organisations would suffer if they would fail to recognise how compromised project management is in their business. Below are some, among many, projects that fail due to lack of effective governance:

a) The Hubble Space Telescope

Launched in 1990, NASA's extraordinary project promised to bring pictures of the universe of a clarity never seen before. Despite overcoming enormous technical challenges, the malfunction of a measuring device used during the polishing of the primary mirror rendered every image blurred. NASA suffered huge and adverse publicity as a result, and had to wait three years before the necessary corrections could be made and its reputation be reinstated.

b) License Application Mitigation Project

The Washington State Department of licensing initiated a five year, $42million project to computerise the state's vehicle registration and license renewal processes. The budget ballooned, the requirements were drastically changed during the course of the project, and even if it had finished, the outcome would have been obsolete by the time of completion.

After seven years, and when approximately $40million had been spent, the project was cancelled.

c) The Scottish Parliament

This project cost more than ten times the budget for the building. One would argue that the money could have been invested elsewhere and given the taxpayers a better return.

d) The Channel Tunnel

This is a magnificent technical achievement that did not generate sufficient customer interest to secure its financial future.

e) Kansai International Airport

Opened in an artificial island off the city of Osaka in Japan 1994, this extraordinary project was plagued by speculation that planners badly underestimated how much the island would sink, and whether it would do so evenly as the site settled. Six years after opening, the airport's operator was driven to invest in flood protection measures, partly funded by higher landing charges which resulted in a huge drop in traffic. So, although the project overcame many people's minds, Kasai will be remembered as the sinking airport.

2.5 Time and Cost Performance in Projects

For a project to thrive, it must exist within surroundings that are congenial to its commissioning, management, funding, specification, building, testing and delivery. Projects launched in the wrong environment hardly succeed.

In order to put into perspective what has been said about time and cost performance in projects in Botswana, previous work on the subject had been reviewed.

2.5.1 Time and Cost Performance in Projects in Europe

Bordoli & Baldwin (1998), stated that the largest contributors to claims are post contract changes which they found to have contributed 25% of claims, different site conditions and unfulfilled duties by the consultant which stood at 14.6%.

Sullivan & Harris (1985), maintained that on the projects undertaken in the United Kingdom and overseas the delays of projects in the UK were mainly caused by late receipt of information, variations of work, mechanical and electrical construction and procurement

delays, underground problems and bad weather. The study recommended the need for team building and greater integration of skills especially at the early stages of project planning and design development.

Ardit *et al* (1985), showed that in 1975 only 22% of projects were completed within time and cost while 18% were completed with as much as 4 years delay. Data collected from 126 public projects undertaken by contractors experienced 34.6% of time and cost overruns. They indicated that the major causes of delays were mainly due to: shortage of resources, materials and manpower, public agencies and contractor's financial difficulties which were mainly caused by late payments, limited possibilities of advance payments, insufficient budget and expensive bonds. Their report went on to list some of the things that could be done in trying to mitigate the problems that caused the said time and cost overruns which were as follows; establishment of good industry practices, sufficient time and effort to be allocated to the feasibility study and design processes and also to devise means and ways to improve the authority structure and decision making mechanisms from all the project parties involved.

Olawale & Sun (2010), pointed out that despite the availability of various control techniques and project control software, many construction projects still do not achieve their cost and time objectives. They asserted that in the construction industry, the aim of the project control is to ensure that the projects finish on time and within budget and achieving other project objectives. They said that it is a complex task undertaken by project managers in practice, which involves constantly measuring progress, evaluating plans, and taking corrective actions as and when the need arise. In their survey which they conducted on 250 construction project organisations in the UK which was followed by face-to-face interviews with experienced practitioners from 15 of those organisations, common factors that inhibit both time and cost control during construction projects were identified as design changes, risks/uncertainties, inaccurate evaluation of project time/duration, complexities and non-performance of subcontractors.

2.5.2 Time and Cost Performance in Projects in Asia

Asian countries where there has been some literature on the topic are Malaysia, Hong Kong, Vietnam and Pakistan. Alwi & Hampson (2002), found out that projects can be delayed for a large number of reasons and usually the impact is on time and cost. The causes of delay in the construction industry of Indonesia are influenced not only by labour, but also by other factors such as equipment, materials, construction methods, site management and professional

management. Al-Momani (2002), added that on the investigation into the causes of delays on 130 public projects in Jordan, they discovered that the main causes of delay were poor design, user changes, weather, site conditions, late deliveries, economic conditions and increases in quality. For Hampson *et al* (2001), the destructive conflict resolution measures led to additional costs and delays in their project.

Lo *et al* (2006), also addressed the differences in perception which to an extent are caused by the blaming attitude. The practitioners according to the study admitted their own faults. There was an argument between the client and the consultant regarding the consultant's poor supervision and quite a significant difference/misunderstanding between the consultant and the contractor on the shoddy work done. This was not surprising because the consultant in most cases are the supervisors of the client to the contractors so the blaming becomes natural in the sense that if the project is not going according to plan, the consultant would blame the contractor and the contractor would blame the consultant sighting in some instances the delay in approving completed works and certifying works for payments, resulting in the project experiencing time and cost overruns.

Long *et al* (2004), stated that in their study conducted in Vietnam on large construction projects in developing countries, major causes of delays were; incompetent designers and contractors who were responsible for inadequate project management assistance, impractical designs and lack of client involvement through project life while contractors would be responsible for their financial difficulties, incompetent project team and poor site management. They also identified poor estimation and change management which are caused by inaccurate time and cost estimation and excessive change orders, social and technological issues that are caused by obsolete technology, bureaucracy and fraudulent practices and kickbacks, site related issues being caused by slow site clearance and unsatisfactory site compensations and improper techniques and tools that are due to inadequate modern equipment and improper planning, monitoring and scheduling as major causes.

They revealed that contractors in developing countries like Vietnam are being faced with problems imposed by the industry infrastructure, inadequate information and frequent changes in instructions and failure to meet obligations on the part of the clients and consultants. They then recommended that effective construction management at corporate, process, project and activity level should be introduced to professionals to enhance the construction industry performance in Vietnam.

Saram & Ahmed (2001), observed that coordination in the construction industry is not given the level of importance it deserves. Coordination involves identifying strategic activities and potential delays and ensuring timelines of all works. To have good coordination, regular meetings, project reviews and analysing the project performance, detecting variances and dealing with their effects should be undertaken on a regular basis. In the study, it was also pointed out also that there are six most important activities which were; identifying strategic activities and their potential delays, ensuring timeline of all works carried out, maintaining record relationship of all drawings, information, directives, verbal instructions and documents received from the consultant and the client, the three parties to maintaining proper relationship, managing the quality of all works being carried out and liaising with within each other for common understanding and proper product output.

Cost overrun problem has significantly affected the prices of construction projects. This trend of overrun has become a global concern. Together with the country's development, it also has negative effect on low and middle class people in achieving the basic needs for life, i.e. a house. Various researchers have highlighted different findings about poor cost performance in construction projects. Frame (1997), noted in his study of investigating 8000 projects that only 16% of the projects could satisfy the three famous performance criteria i.e. projects being completed on time, within budget cost and quality standard, while Flyvberg *et al* (2003), study of 258 projects in 20 nations concluded that 90% of projects faced cost overrun and the cost performance has not been improved over the time. In fact, it is in this same order of magnitude as it was 10, 30 or 70 years ago.

Chan & Kumaraswamy (1997), concluded that the five principal and common factors of delays are poor risk management and supervision, unforeseen site conditions, slow decision making involving all project teams, client-initiated variations and necessary variations of works.

2.5.3 Time and Cost Performance in Projects in USA

Flores & Chase (2005), explained why it is important that before the project starts all the necessary information and particulars should be complete. According to them, poor quality documents are a major cause of problems that later occur in projects. They further indicated that ability to influence the final cost over the project life decreases with time from start to finish. They said that 80% of the project costs are established in the first 20% of the project's life and that it is very important to take time during design to produce a more complete set of

bid documents. Project control methods during design should follow a trend towards user defined criteria, third part quality checks, established design criteria for progress review milestones, coordination between design disciplines and site establishment, drawing control and coordination for monitoring design progress.

2.5.4 Time and Cost Performance in Projects in Middle East

A lot of researches have been carried out in the Middle East on the time and cost effects in construction projects. Construction claims are in most cases a direct result or effect of circumstances that can most likely cause time and cost overruns. Zaleldin (2006), suggested that there are six types of claims; being contract ambiguity, delay claims, acceleration claims, additional works claims, and different site conditions claims. All these result in parties claiming to redress mainly because they are disruptive in their nature. On his study he further listed twenty five claims based on frequency of occurrence as those that are most likely to cause delays, starting with the five that are the most frequently occurring, being variation orders, owner/client bringing changes orally, late payments, low contract price due to high competition.

Al-Momani (2002), indicated that the main causes of time and cost overruns were due to designers, user changes, inclement weather, poor site conditions, economic conditions and increase in quality of resources.

Assaf & Al-Hejji (2006), commented found that all the three parties, the client, the consultant and the contractor, tend to differ on what they perceive as the most important cause of delay. The only cause which they concurred with was the change orders. It was then concluded that projects experienced 70% time overruns. Of the 76 projects considered, 45 experienced delays.

Enshassi *et al* (2009), mentioned that the most important factors affecting project performance in the Gaza Strip and Palestine are borders and roads closures leading to material shortage, unavailability of resources, low level of project leadership skills, escalation of material prices, unavailability of highly experienced and qualified personnel and poor quality of available equipment and raw materials.

2.5.5 Time and Cost Performance in Projects in Africa

Mansfield *et al* (1994), pointed out that most of the overruns are mostly due to finance and payment arrangements, poor contract administration, material shortages, inaccurate estimation and price fluctuations. Sonuga *et al* (2002), indicated that the main reasons for the project to fail are inadequate source of funding, price variations and corruption.

Frimpong *et al* (2003), highlighted that time and cost overruns occur due to monthly payments difficulties from agencies, poor contract management, material procurement, poor technical performance and escalation of material costs. Aibinu & Jagboro (2002), added that delays in construction projects result in time and cost overruns, disputes, arbitration, litigation and at times total abandonment of the project

Elinwa & Joshua (2001), stated that the mode of financing and payment for completed works, improper project planning, underestimation of project duration, frequent changes in design and material specification, non-compliant to contract condition and poor site management are the main factors.

The cost overruns in construction projects resulted from various factors which are vital to uncover and understand. Ameh *et al* (2010), suggested in their study of 42 cost overruns causes that lack of experience of contractors, cost of materials, fluctuation in the prices of materials, frequent design changes, economic stability, high interest rates charged by banks on loans and mode of financing, bonds and late payments as well as fraudulent practice and kickbacks were dominant factors causing cost overruns in Nigeria. In Nigeria again, Omoregie & Radford (2006), reported that a minimum average of cost escalation in construction projects is 14%, while in Portugal projects faced a minimum of 12% cost overrun.

Baloyi & Bekker (2011), mentioned that even though South Africa completed numerous large construction projects over the years, the award of the FIFA Soccer World Cup in 2010 drew the attention to South Africa's ability to deliver large construction projects within time and budget. Burdened with the negative global view towards the African project failure syndrome and contingency venue were already identified. They pointed out that South African construction industry started work under much doubt regarding its capability to complete the massive construction work on the ten stadia across South Africa. Once the stadia were completed, no formal or final cost figure was released by government or any

other public institution. However, the Minister of Finance was quoted in The Africa Report Ballong S (2010): online that: "we have been confronted with an escalation of costs" and the budget for all the stadia is USD267 million in deficits. Baloyi & Bekker (2011), went on to say that even though the stadia were completed in time for FIFA World Cup, some were behind schedule and not ready for Confederations Cup in 2009. In their study, they found out that client –related factors causing time and cost overruns are late payments, approval delays, changes to works and design, technical definition, client representation, design delays, decision making and internal skills shortages, delay in financing, statutory approvals, unpredictable site conditions, escalation and inflation and shortage of materials, inaccurate material estimate, change order by client during construction, difference between the selected bid and the consultant's estimate, poor information dissemination, incomplete drawings, late issue of instructions and delay in work approval.

2.5.6 Time and Cost Performance in Projects in Botswana

Swarnadhipathi & Boyd (2007), explained that the business environment in Botswana has become highly competitive and so construction companies have to cope with this added complexity by managing their projects closely. The result of their study confirmed that the most significant problems in time delays from the contractor's perspective were design changes and material supply, government or client influence making projects more complex, the geography constraints that are making material and plant supply difficult and multi-cultural issues bringing people management problem to projects.

Chimwaso (2000), pointed out that improving cost performance in public projects remains one of the challenges facing the construction industry in developing countries. Researchers have found out that there are many cases of cost overruns as compared to projects that have been completed within budget. He added that some significant factors that influenced construction cost overruns in Botswana included incomplete design at time of tender, technical omissions at design stage and contractual claims, additional work at client's request and adjustments of prime costs and provisional sums.

Pelontle (2009), found out that the most frequent cost overrun causal factors were inadequate project brief, insufficient/inadequate project design, lack of project appointment of competent project personnel, need for improved project monitoring, failure to awarding contracts to reputable/competent contractors, poor monitoring teams and providing limited time and financial facilities, clients and project managers were found to play a major contributory role

in activities that lead to project cost overruns at conception/planning/designing phase. The project implementation phase allocated blame to contractors, architects and quantity surveyors for cost overruns at completion/commissioning phase.

Kasese *et al* (2011), pointed out that time and cost overruns have been an issue in many construction industries around the world. Botswana is no exception to this rule. They went on to say that outcries from the government, politicians and the public at large caused by persistent time and cost overruns have become more common in recent times. These overruns have been experienced in various different National Development Plans (NDPs). Their study has shown that time and cost overruns are a real problem in the Botswana Local Authorities. Leading causes are inefficient contractor's management, low productivity of contractor's workforce, low productivity of contractor's equipment, client's responsibility and design errors by consultants.

2.6 Summary of Factors

Chapter 2 has shown the findings of past researches on factors causing time and cost overruns nationally, in Africa and worldwide. This is summarised in the Table 3 below:

Researches show that many factors causing time and cost overruns have been found globally, Botswana included. It is felt that there is a need to establish what impact some of these factors have on road projects in Botswana as it can be seen that not many factors have been checked on projects in Botswana; hence the need to carry out this study. Most of the factors this study has been picked from the above factors and few from the researcher's observation.

Table 3: Table showing the findings of past researches on factors causing time and cost overruns nationally, in Africa and worldwide

Factors	Europe	Asia	USA	Middle East	Africa	Botswana
Shortage of resources	✓	✓		✓	✓	
Shortage of materials	✓	✓		✓	✓	
Shortage of manpower	✓	✓			✓	✓
Public agencies	✓					
Contractor's financial difficulties due to late payments	✓				✓	
Limited possibilities of advance payment	✓					
Insufficient budget	✓				✓	
Expensive bonds	✓				✓	
Design changes	✓	✓			✓	✓
High risks/uncertainties	✓				✓	
Inaccurate evaluation of project duration	✓					
Project complexities	✓					✓

Low performance of Subcontractors	✓					
Poor design		✓	✓	✓	✓	✓
User changes		✓		✓	✓	
Late deliveries		✓			✓	
Economic conditions		✓		✓	✓	
Poor quality of work		✓		✓		
Destructive conflicts resolutions		✓				
Blaming attitudes		✓				✓
Delay in approving completed works and certifying them for payments		✓				✓
Incompetent designers and contractors		✓		✓	✓	✓
Impractical designs		✓				
Lack of client involvement throughout the project cycle		✓			✓	
Incompetent project team		✓		✓	✓	✓
Poor project cost estimate		✓			✓	
Change of management		✓				
Social and technological issues		✓				
Bureaucracy		✓			✓	
Fraudulent practices		✓			✓	
Site issues		✓				
Improper planning, monitoring and scheduling		✓			✓	✓
Inadequate information		✓				
Client failing to meet obligations		✓			✓	
Slow/Late decision making		✓			✓	
Client initiated variations		✓			✓	✓
Poor project control					✓	
Change orders				✓	✓	
Closure of border posts and roads				✓		
Price escalation				✓	✓	
Poor quality of available equipment and raw materials				✓		
Poor finance and payment arrangements resulting in delayed payments					✓	
Poor contract administration					✓	✓
Price fluctuation					✓	
Inadequate source of funding					✓	
Corruption					✓	
Delayed procurement of resources					✓	
Inadequate project brief						✓
Claims	✓			✓	✓	✓
Site conditions	✓	✓		✓	✓	
Unfulfilled duties by the Consultant	✓					✓
Late receipt of information	✓				✓	
Variation of works	✓	✓			✓	
Mechanical and Electrical Contractors procurement delays	✓					✓
Underground problems	✓				✓	
Bad/inclement weather	✓	✓		✓		
Construction methods		✓			✓	
Poor site management		✓		✓	✓	✓
Poor professional management		✓		✓	✓	✓
Disputes					✓	
Arbitrations					✓	
Abandonment of projects					✓	
Change of material specifications					✓	
High interest rates charged by banks					✓	
Client influence to make project complex						✓
Multi-cultural issues						✓

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter presents the research strategy that has been employed in answering the research question. The chapter also presents the methods and techniques that were found suitable for data collection and analysis.

Kothari (1995), suggested that research could be defined as a scientific and systematic search for pertinent information on a specific topic. It can also be defined as a search for knowledge through objective and systematic method of finding solutions to a problem. The term research also refers to the systematic method consisting of enunciating the problem, formulating a hypothesis, collecting the facts or data, analysing the facts and reaching certain conclusions either in the form of solution(s) towards the concerned problem or in certain generalization for some theoretical formulation.

In any research one needs to have a clear method of achieving the objective of undertaking it. It is expected that at the end of the research the set objectives should have been achieved and if not, there should be reasons why they were not achieved. The research questions asked or which the researcher wants to answer are the guiding principles of the research.

The research question of the study is:

"What should be done to improve time and cost performance in roads projects in the Roads Department of the Ministry of Transport and Communications, Botswana?"

The main aim of research is to find out the truth which is hidden and which has not been discovered yet. The research that is being done has not been undertaken in Botswana to the best of the writer's knowledge.

Reviews of past studies indicated that similar studies were undertaken in other countries but were mostly in building construction projects. This study sought to unearth the time and cost performance in road projects in Botswana. It should be noted that the study is specifically focusing in projects in the Roads Department as the Local Government has Roads Division that is constructing roads within the villages, Towns and Cities.

The objectives of the study would be;

1. To identify the causes of time and cost overruns in road projects in Roads Department.
2. To rank these causes in order of their significance/severity.
3. To explore the mitigation measures for successful time and cost performance in road projects.

3.2 Research Process

Biklen & Bogman (1998), defined research design as an overall plan for collecting and analysing data including measures to enhance both internal and external validity. Similarly Diekmann and Al-Tatabai (1992), noted that research design is the term often used to describe a number of decisions which need to be taken in the data collection. The design, therefore constitute the blueprint of the collection, measurement and analysis of data. This study is designed to collect data in order to assess time and cost performance in roads projects.

Leedy and Ormrod (2005), defined research survey as:

> The research being carried out is descriptive and analytical survey methods (observations and questionnaires based). The purpose of the descriptive research is to solve the research problem through the interpretation of the data that have been gathered. It is used to obtain data in order to meet the research objectives. The questionnaire tested respondents' views and knowledge would be used regarding the issues related to time and cost performance on the roads projects.

The study is concerned with subjective assessment of attitudes, opinions and perceptions of the Roads Department practitioners. It is consists of two parts where the first part entailed conducting a detailed literature review to establish what entails time and cost performance in construction projects globally and the second part consists of the structured questionnaire given specifically to the practitioners who are directly involved in project implementation in the Department.

3.3 Population and Sample Size

The survey population of the study is mainly all practitioners (Roads Engineers) that amount to 67 in the Department.

The sample size is made of 38, which is the number of those that are fully involved in project implementation of roads projects, including the top management in the Department. Sample size is built as follows, 3 of top managers, 12 project managers and 17 project officers and 6 project team members.

3.4 Sampling Strategy

The techniques used to select the sample size requires prior knowledge of the target population which allows a determination of the sample size needed to achieve estimate with accepted and accuracy of the population.

Deliberate or purposive sampling, a non-probability sampling was used in the study. The goal of the sampling method was to obtain a sample that is a representative of the population. In the group of 67 Engineers in the Department, 38 were selected. These are the ones that are directly working on project implementation, as a result, were used in obtaining the respondents of the study. There has been a deliberate selection from the population size and it is guaranteed that the sample available would provide the wanted response; as a result, this sampling has been found appropriate.

3.5 Questionnaire Design

Zikmund (2003), stressed that a questionnaire is relevant if no unnecessary information is collected and the information necessary for solving the problems obtained. Accuracy means that the information is reliable and valid. The language of the research questionnaire should be simple to allow for variations in educational levels. Leading or loaded questions should suggest answers to the respondent, as well as questions that induce them to give socially desirable answers.

This research is considered exploratory, as such, a questionnaire survey is chosen as an appropriate approach to evaluate the factors causing failure on time and cost performance in roads projects. The research questionnaire seeks opinions from the Department's practitioners. It entails identified factors causing time and cost overruns in road projects where the responses will be evaluated to establish the severity they have on projects.

The questionnaire is designed for: i) technical top management, ii) project managers, iii) project officers and iv) other project team members, e.g. environmentalists and those dealing with land acquisition.

The questionnaire comprises two parts; the first part being the demographic information of the respondent such as professional status and working experiences; while the second part contains the questions which are directly related to the subject of the study. The questions are given as collection of factors picked from past researches from chapter 2. The respondents will provide their assessment as rated very high, high, moderate and low. These factors will be ranked according to frequency of occurrence. Only those factors that ranked 55% and above were considered significant and severe.

3.6 Data Collection Procedures

The secondary data for this research project was obtained from literature review of relevant publications and information sourced mostly from the University of Botswana library. The sources included conference papers, articles, reports, books, and journals, codes of practice, other theses, and the Internet. Relevant information from national newspapers was also used.

The primary data was obtained through a structured questionnaire to project officers who are directly working on implementation of roads projects. Top management is included as they also form part of the project implementers.

Table 4 below is showing the time and cost factors that had been identified and to be evaluated for the study.

Table 4: Time and Cost factors that have been identified for this study are

Time Factors	Cost Factors
Ineffective planning and monitoring	Inaccurate Project cost estimate
Absence of project management control tool to follow	Poor cost control
Poor contract management by the client	Price increase of resources
Poor involvement by top management in project implementation	Changes in Material type
Delay in decision making	Inability to foresee risks
Bureaucracy	Redoing of work due to abnormal weather conditions
Delay in process payment	Interest charged due to delayed payments
Client do not follow the right channel of communication	Encountering claims due to Clients delayed decisions
Staff rotation on project	Clients failure to give clear instructions
Shortage of practitioners	Incompetent practitioners
Staff turnover	Change of scope of work
Delay in obtaining surface right for the contractor to take over	
Abnormal weather condition	
Conflict, dispute and strike	
Rejected work	
Failure to pick mistakes and discrepancies on design document	
Poor cooperation with the consultant	
Poor cooperation with the contractor	
Contractor's poor cash flow due to delay in making payments	

3.7 Analysis of Results

This is the process of inspecting, cleaning, transforming and modeling data with the goal of discovering useful information, suggesting recommendations and conclusion. An analysis of the summarized research results is done in order to make meaningful conclusions and recommendations. Bordoli & Baldwin (1998), stated that data analysis is a mechanism for

reducing and organising the bulk data to produce findings. Findings ultimately aid researchers in the interpretation of their work. In this study analysis of the questionnaire was based on non-statistical and statistical calculations.

On non-statistical approach, respondents gave their views on each factor and general observation according to frequency of occurrence of factors was used to display data; display was in the form of figures, charts and tables. In analysing data, the factors ranking 55% and above were considered significant, severe and would need mitigation measures against them.

On the statistical approach, in analyzing and interpreting data, SPSS software package was used in determining pattern of relationship among the time and cost factors as respondents had given their views. This package has provided analysis tools such as correlation, regression coefficient and factor analysis which were used to represent data and its association.

The statistical terms used in the package are explained below.

3.7.1 Exploratory Factor Analysis

This is the technique used to uncover the underlying structure of a relatively large set of variables; it identifies the underlying relationships between measured variables where in this case there are time and cost factors causing overruns that need to be uncovered to see their relationship in project performance. This implies that this technique is suitable as it is going to identifying the relationship between time and cost.

Below are the explanations of terms used in this analysis.

a) The Kaiser-Meyer-Olkin and The Bartlett's Test of Sphericity

Measure of Sampling Adequacy is a statistical tool that indicates the proportion of variance in the variables that might be caused by underlying factors. Merkle *et al* (1998), commented that it is the test that assesses the degree of relationship between the sets of variables and compares the magnitude of the observed correlation to the magnitude of the partial correlation. High value (close to 1.0) indicates that a factor analysis is useful with your data. This implies that those factors that come out to be above 0.5 to 1 will be found worth of further analysis. If the value is less than 0.50, the result of the factor analysis will not be very useful and does not show severity.

The Bartlett's Test of Sphericity tests the chances that the variance and covariance matrices are suitable for each other. Merkle *et al* (1998), went on to say that it is one of the methods used to establish whether factor analysis is appropriate for the data set. When the variables are completely unrelated, then factor analysis is inappropriate and all the factor results will be below 0.5. This method will prove the appropriateness of the time and cost factors if they do not come out below 0.5.

b) Factor Extraction

Factor extraction is the method of using the factors under study and establishes their variances. It is determined in two stages, namely, the percentage of variance and the eigenvalues.

- **Percentage of Variance**

According to Rietveld & Van Hout (1993), it is assumed that in factor analysis the variables do not account for 100% of the variance. Although the loading patterns of the factors extracted do not differ substantially, their respective amounts of explained variance do.

- **Eigenvalues**

An eigenvalue is the total variance explained by each factor. Mehta *et al* (2000), and Field, (2000) noted that the general rule of thumb of extracting factors with eigenvalues greater than 1.0 is considered appropriate. Aaker *et al* (2004), suggested that the rationale is that the variation in each variable is 1.0 after the variable has been standardized and a factor should account for at least that much variation to be considered useful from a data summarization perspective. Hence in this study, only factors with eigenvalue greater than 1.0 were retained.

c) Analysis of Variance (ANOVA)

Berwick *et al* (2004), described that ANOVA as a technique for analyzing the way in which the mean of variables is affected by different types and combination of factors. The mean quality scores for each factor were computed and compared with the help of the ANOVA technique to delve into the discriminatory power of alternative choices on the measurement scales. Two independent analyses of variances were conducted, being that of Time and Cost.

d) Pearson Correlation Coefficient

Correlation is a technique used for investigating the relationship between two quantitative, continuous variables. A Pearson Correlation Coefficient is the measure of the strength of the association between the two variables or factors; hence it was found a suitable procedure to be used to test the relationship between time and cost.

e) Regression Coefficient

In statistics, regression analysis is a process for estimating the relationships among variables. It includes many techniques for modeling and analyzing several variables, when the focus is on the relationship between a dependent variable and one or more independent variables (or 'predictors'). More specifically, regression analysis helps one understand how the typical value of the dependent variable (or 'criterion variable') changes when any one of the independent variables is varied, while the other independent variables are held fixed. Most commonly, regression analysis estimates the conditional expectation of the dependent variable given the independent variables – that is, the average value of the dependent variable when the independent variables are fixed.

3.8 Expected Results

The results from these findings are going to give, in a ranking manner, time and cost factors that have been found significant and severe to project performance so that mitigations and recommendations would be given against the right factors.

The above statistical rules are going to clean, transform and cause a discovery of useful information on the findings on time and cost factors. These techniques are going to show if these factors have been appropriately put against time and cost; this will be evidenced by the findings being above 0.5 as explained.

Those factors that were found severe by statistical analysis were expected to be those having high frequency of occurrence.

CHAPTER FOUR: PRESENTATION OF RESULTS AND ANALYSIS OF DATA

4.1 Introduction

This chapter examines and analyses data gathered from the questionnaire administered. Adèr (2008), mentioned that analysis of data is a process of inspecting, cleaning, transforming, and modeling data with the goal of highlighting useful information, suggesting conclusions, and supporting decision making. In order to analyze and interpret data, SPSS software package was used. This study mainly focused in evaluating factors impacting negatively on time and cost performance in road projects. The different type of tools such as Correlation, Frequency, Regression Coefficient, Factor Analysis, Custom Table and Charts are used to represent data and its association. Tables, charts and descriptive explanations have been employed to illustrate data gathered from the field to make the research more meaningful.

4.2 Analysis of the Results

4.2.1 Demographic Details

Demographic details show respondents' primary information such as age, gender, qualification and marital status to support their opinion on research

The results show out of a total of 38 respondents, 44.7% (17) are project officers followed by 39.5% (15) who were project managers. 15.8% (6) are project team members. Figure 3 below illustrates the findings.

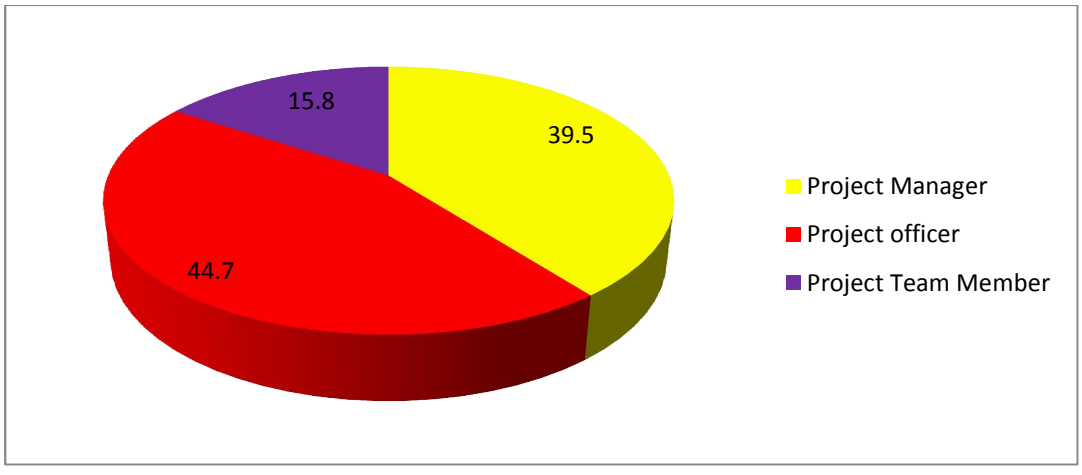

Figure 3: Field of expertise

4.2.2 Work Experience

The data has shown that 28.9% (11) have 6 to 10 years' experience, followed by 16 to 20 years which translates 21.1% (8). The work experiences between 0 to 5 years and 21 to 25 years constitute 15.8% each (6) and 7.9% (3) belonging to 11 to 15 years. Only 1 respondent has 26 and above years of experience in their profession while 3 did not respond to this question. This is illustrated by figure 4 below.

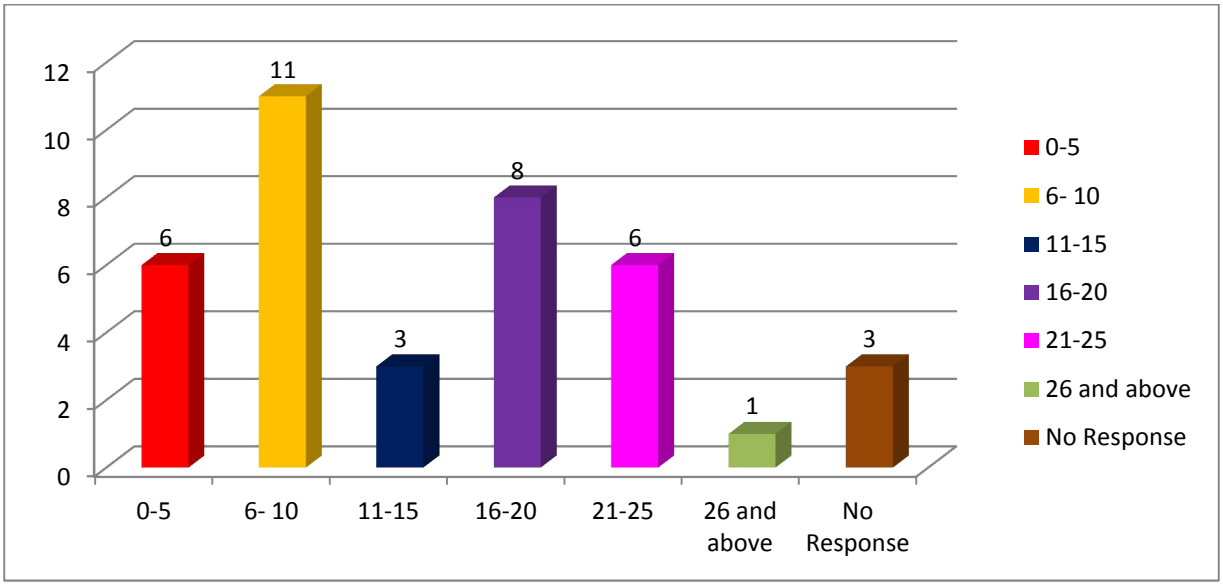

Figure 4: Work Experience

4.3 Time Factors

19 time factors were identified and given to respondents who include the top managers, the project managers and officers and the project team members who responded as given in Table 5 below:

Table 5: Findings on Frequency on Time Factors

Factors	Very High		High		Moderate		Low	
	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %
Ineffective planning and monitoring	13	34.2	13	34.2	10	26.3	2	5.3
Absence of project management control tool to follow	11	28.9	14	36.8	9	23.7	4	10.5
Poor contract management by the client	6	15.8	10	26.3	19	50	3	7.9
Poor involvement by top management in project implementation	10	50.0	6	20.0	17	21.7	5	8.3
Delay in decision making	16	42.1	12	31.6	9	23.7	1	2.6
Bureaucracy	12	31.6	12	31.6	10	26.3	4	10.5
Delay in process payment	5	33.2%	11	28.9%	13	14.2%	9	23.7%
Client do not follow the right channel of communication	1	2.6%	9	23.7%	18	47.4%	10	26.3%
Staff rotation on project	10	26.3%	14	36.8%	10	26.3%	4	10.5%
Shortage of practitioners	1	2.6%	17	44.7%	14	36.8%	6	15.8%
Staff turnover	8	21.1%	12	31.6%	14	36.8%	4	10.5%
Delay in obtaining surface right for the contractor to take over	11	18.9%	15	35.5%	10	36.3%	2	9.3%
Abnormal weather condition	2	5.3%	8	21.1%	17	44.7%	11	28.9%
Conflict, dispute and strike	2	5.3%	4	10.5%	9	23.7%	23	60.5%
Rejected work	0	.0%	4	10.5%	20	52.6%	14	36.8%
Failure to pick mistakes and discrepancies on design document	7	18.4%	11	28.9%	17	44.7%	3	7.9%
Poor cooperation with the consultant	1	2.6%	6	15.8%	18	47.4%	13	34.2%
Poor cooperation with the contractor	1	2.6%	8	21.1%	20	52.6%	9	23.7%
Contractors poor cash flow due to delay in making payments	8	20.1%	14	34.8%	10	26.3%	6	18.8%

4.3.1 Observations from the Findings on Time Factors

Observations on Table 6 below are picked from the frequency in Table 5 above. Very high and high responses are grouped together while moderate and low are also grouped together.

Only those factors at 55% and above are considered significant and are severely causing time overruns.

Table 6: Observations on Time Factors

FACTORS	OBSERVATIONS	
	Response percentage to high severity (Very high to high)	Response percentage to low severity (Moderate to low)
Ineffective planning and monitoring	68.4%	31.6%
Absence of Project management control tool to follow	65.7%	34.3%
Poor contract management by the client	42.1%	57.9%
Poor involvement by top management in project implementation	70.0%	30.0%
Delay in decision making	73.7%	26.3%
Bureaucracy	63.2%	36.8%
Delay in process payment	62.1%	37.9%
Client do not follow the right channel of communication	26.3%	73.7%
Staff rotation on project	63.1%	36.9%
Shortage of practitioners	47.3%	52.7%
Staff turnover	52.7%	47.3%
Delay in obtaining surface right for the contractor to take over	54.4%	45.6%
Abnormal Weather condition	26.4%	73.6%
Conflict, dispute and strike	15.8%	84.2%
Rejected work	10.5%	89.5%
Failure to pick mistakes and discrepancies on design document	47.3%	52.7%
Poor cooperation with the consultant	18.4%	81.6%
Poor cooperation with the contractor	23.7%	76.3%
Contractors poor cash flow due to delay in making payments	54.9%	45.1%

According to the findings on Table 6, time factors that are found severe and of significance are;

a) Delay in decision making at 73.7%
b) Poor involvement of top management at 70.0%
c) Ineffective planning and monitoring at 68.4%
d) Absence of PM control tool to follow at 65.7%
e) Bureaucracy at 63.2%
f) Staff rotation at 63.1%

g) Delay in processing payments at 62.1%

4.4 Cost Factors

11 cost factors were identified and given to project implementers who include the top managers, project managers and officers and project team members, who responded as given in Table 7 below:

Table 7: Findings on Frequency on Cost Factors

Factors	Very High		High		Moderate		Low	
	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %
Inaccurate project cost estimate	11	28.9%	16	42.1%	8	21.1%	3	7.9%
Poor cost control	8	18.1%	15	29.5%	11	38.9%	4	13.5%
Price increase of resources	2	50.3%	8	21.1%	19	5.0%	9	23.7%
Changes in material type	2	5.3%	10	26.3%	23	60.5%	3	7.9%
Change of scope of work	5	13.2%	9	23.7%	20	52.6%	4	10.5%
Redoing of work due to abnormal weather conditions	1	2.6%	1	2.6%	21	55.3%	15	39.5%
Interest charged due to deployed payments	6	15.8%	12	31.6%	12	31.6%	8	21.1%
Clients failure to give clear instructions	1	2.6%	16	42.1%	18	47.4%	3	7.9%
Encountering claims due to clients delayed decisions	3	7.9%	24	63.2%	11	28.9%	0	.0%
Incompetent practitioners	4	10.8%	15	40.5%	12	32.4%	6	16.2%
Inability to foresee risks	9	23.7%	19	50.0%	9	23.7%	1	2.6%

4.4.1 Observations from the Findings on Cost Factors

Observations are picked from the frequency Table 7 above. Very high and high responses are grouped together while moderate and low are also grouped together. Only those factors at 55% and above are considered significant and are severely causing cost overruns.

According to the findings Table 8, cost factors that are found severe and of significance are

a) Inability to foresee risks at 73.7%

b) Price increase of resources at 71.4%
c) Encountering claims due to Client's delayed decisions at 71.1%
d) Inaccurate project estimate at 71.0%

Table 8: Observations on Cost Factors

FACTORS	OBSERVATIONS	
	Response percentage to high severity (Very high to high)	Response percentage to low severity (Moderate to low)
Inaccurate project cost estimate	71.0%	29.0%
Poor cost control	47.6%	52.4%
Price increase of resources	71.4%	28.6%
Changes in material type	31.6%	68.4%
Change of scope of work	36.9%	63.1%
Redoing of work due to abnormal weather conditions	5.2%	94.8%
Interest charged due to delayed payments	47.4%	52.6%
Clients failure to give clear instructions	44.8%	55.2%
Encountering claims due to clients delayed decisions	71.1%	28.1%
Incompetent practitioners	51.3%	48.7%
Inability to foresee risks	73.7%	26.3%

4.5 Analysis of Time and Cost Factors through SPSS

4.5.1 Factor Analysis on Time

The table 9 shows the proportion of each variable's variance that can be explained by the retained factors. Variables with high values are well represented in the common factor space, while variables with low values are not well represented and are considered not effective for further analysing, such as rejected work whose extraction is .473 being below .50). The communalities, KMO and Bartlett's analysis show that there is a high level of significance on these variables so that it supports factor analysis. However, the variable, works rejected, should be excluded as its extraction value is below 50%.

Table 9: Factor Analyses Findings on Time Factors

Communalities	**KMO and Bartlett's Test**				
	Initial	Extraction	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.597
Ineffective planning and monitoring	1.000	0.804	Bartlett's Test of Sphericity	Approx. Chi-Square	315.478
Absence of project management control tool to follow	1.000	0.743		df	171
Poor contract management by the client	1.000	0.747		Sig.	0.000
Poor involvement by top management in project implementation	1.000	0.831			
Delay in decision making	1.000	0.653			
Bureaucracy	1.000	0.810			
Delay in process payment	1.000	0.817			
Client does not follow the right channel of communication	1.000	0.761			
Shortage of practitioners	1.000	0.680			
Staff rotation on project	1.000	0.820			
Staff turnover	1.000	0.618			
Delay in obtaining surface right for the contractor to take over	1.000	0.669			
Abnormal Weather condition	1.000	0.688			
Conflict, dispute and strike	1.000	0.615			
Rejected work	1.000	0.473			
Failure to pick mistakes and discrepancies on design document	1.000	0.611			
Poor cooperation with the consultant	1.000	0.776			
Poor cooperation with the contractor	1.000	0.799			
Contractors poor cash flow due to delay in making payments	1.000	0.639			

The table 10 below is ranking the factors in order of significance according to factor analysis on time factors given above.

Table 10: Ranking of Findings on Factor Analysis on Time

Factor	Extraction no.	Rank on significance
Poor involvement of top management in project implementation	0.831	1
Staff rotation on projects	0.820	2
Delay in processing payments	0.817	3
Bureaucracy	0.810	4
Ineffective planning and monitoring	0.804	5
Delay in decision making	0.761	6
Poor contract management by the client	0.747	7
Absence of project management tools to follow	0.743	8
Abnormal weather conditions	0.688	9
Shortage of practitioners	0.680	10
Delay in obtaining surface rights for the contractor to take over the project	0.669	11
Client does not follow the right channel of communication	0.653	12
Staff turn over	0.618	13
Conflicts, disputes and strikes	0.615	14
Failure to pick mistakes and discrepancies on design documents	0.611	15

The variance in Table 11 below shows that in extracting factors only six met the cutoff point i.e. were found having high influence in causing time overruns. They are as sequenced from table 9 above, being poor involvement by top management in project implementation, staff rotation on projects, delay in process payment, bureaucracy, ineffective planning and monitoring and delay in decision making. These constitute 71.3 % of variance to the time factors. These are the top six factors that ranked high, were severe and significant.

Table 11: Total Variance Explained – On Time Factors

Component		Initial Eigenvalues			Extraction Sums of Squared Loadings		
		Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
	1	5.101	26.849	26.849	5.101	26.849	26.849
	2	2.627	13.824	40.673	2.627	13.824	40.673
	3	1.822	9.592	50.265	1.822	9.592	50.265
	4	1.504	7.918	58.183	1.504	7.918	58.183
	5	1.378	7.252	65.435	1.378	7.252	65.435
	6	1.124	5.913	71.348	1.124	5.913	71.348
	7	.914	4.810	76.158			
	8	.720	3.788	79.947			
	9	.681	3.584	83.531			
	10	.611	3.217	86.748			
	11	.571	3.005	89.753			
	12	.488	2.568	92.322			
	13	.353	1.857	94.179			
	14	.328	1.726	95.905			
	15	.288	1.518	97.422			
	16	.187	.982	98.404			
	17	.135	.708	99.113			
	18	.093	.490	99.603			
	19	.076	.397	100.000			
Extraction Method: Principal Component Analysis							

4.5.2 Factor Analysis of Cost

The Table 12 below shows the proportion of each variable's variance that can be explained by the retained factors. Variables with high values are well represented in the common factor space, while variables with low values are not well represented. (In table below, poor cost control should be eliminated as it has given the value lower than 0.5). The communalities, KMO and Bartlett's analysis shows that there is high level of significance on these variables so that it supports factor analysis

Table 12: Factor Analysis on Cost Factors

Communalities	**KMO and Bartlett's Test**				
	Initial	Extraction	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.498
Inaccurate Project cost estimate	1	0.712	Bartlett's Test of Sphericity	Approx. Chi-Square	99.113
Poor cost control	1	0.37		df	55
Price increase of resources	1	0.78		Sig.	0.000
Changes in Material type	1	0.605			
Inability to foresee risks	1	0.824			
Redoing of work due to abnormal weather conditions	1	0.659			
Interest charged due to deployed payments	1	0.59			
Encountering claims due to Clients delayed decisions	1	0.73			
Clients failure to give clear instructions	1	0.624			
Incompetent practitioners	1	0.711			
Change of scope of work	1	0.78			

The table 13 below is ranking the factors in order of significance according to factor analysis on cost factors given above.

Table 13: Ranking of Findings on Factor Analysis on Cost

Factor	**Extraction no.**	**Rank on significance**
Inability to foresee risks	0.824	1
Price increase of resources	0.78	2
Change of scope of work	0.78	2
Encountering claims due to client's delayed decisions	0.73	3
Inaccurate project cost estimate	0.712	4
Incompetent practitioners	0.711	5
Redoing of work due to abnormal weather conditions	0.659	6
Client's failure to give clear instructions	0.624	7
Changes in material type	0.605	8
Interest charged due to delayed payments	0.59	9
Poor cost control	0.37	10

Table 14: Total Variance Explained – On Cost Factors

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.539	23.086	23.086	2.539	23.086	23.086
2	1.690	15.359	38.445	1.690	15.359	38.445
3	1.648	14.984	53.429	1.648	14.984	53.429
4	1.509	13.717	67.146	1.509	13.717	67.146
5	0.856	7.778	74.924			
6	0.816	7.419	82.343			
7	0.671	6.101	88.443			
8	0.450	4.087	92.530			
9	0.356	3.240	95.770			
10	0.253	2.304	98.074			
11	0.212	1.926	100.000			

Extraction Method: Principal Component Analysis. (The components on this table are arranged according to the ranking in Table 13 above)

The variance in Table 14 above shows the actual factors that were extracted. Only four factors met the cutoff points. They are as sequenced from the Table above, being inaccurate project estimate, price increase of resources, inability to foresee risks and encountering claims due to client's delayed decisions. These constitute 67.1 % of variance to the cost factor.

4.6 Correlation between Time and Cost

A Pearson Correlation Coefficient is the measure of the strength of the association between the two variables or factors; hence it was found a suitable procedure to be used to test the relationship between time and cost. Table 15 below shows the outcome that there is a strong positive correlation between time and cost. The Pearson Correlation Value is .695 with double star means that the two factors are highly correlated. Their association is significant as the p value is .000 which is lower than the required significance of $p<.05$.

Table 15: Correlation between Time and Cost

		Cost	Time
Cost	Pearson Correlation	1	0.695**
	Sig. (2-tailed)		0.000
	N	38	38
Time	Pearson Correlation	0.695**	1
	Sig. (2-tailed)	0.000	
	N	38	38

4.7 Time Factors based on Cost Performance

In order to find the most predictable factors to cost performance based on time, a linear regression procedure was performed. The results are summarized in the following regression tables below.

Regression Model and ANOVA

The Regression Model and ANOVA is a model good for giving predictions and it is statistically significant. The R value is 0.906 indicates a higher level of correlation between time and cost. The R^2 value (the "**R Square**" column) indicates how much of the total variation in the dependent variable, cost, can be explained by the independent variable, time. In this case, 82% (0.82) can be explained as very large.

In order to test which time factors are mostly associated with cost, a regression coefficient procedure was performed. The results are in the Tables 16 and 17.

Table 16: Regression Model and ANOVA

	Model R	R Square	df	F	Anova Sig	
	0.906	0.820	19	26.956	4.327	0.002
Regression 513.33			18	6.230		
Residual 110.97			37			
Total 624.31						

Table 17: Coefficient to the Regression Model on Time

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	12.889	3.020		4.269	.000
2	Ineffective planning and monitoring	0.921	0.856	0.205	1.077	.294
3	Absence of Project management control tool to follow	-0.341	0.774	-0.081	-0.440	0.664
4	Poor contract management by the client	-0.380	0.842	-0.080	-0.452	0.656
5	Poor involvement by top management in project implementation	-0.576	0.795	-.145	-.724	0.477
6	Delay in decision making	-0.849	0.720	-0.181	-1.180	0.252
7	Bureaucracy	0.670	0.687	0.163	0.976	0.341
8	Delay in process payment	-0.088	0.640	-0.021	-0.137	0.892
9	Client does not follow the right channel of communication	2.708	0.836	0.519	3.239	0.004
10	Staff rotation on project	1.188	0.541	0.279	2.195	0.040
11	Shortage of practitioners	0.942	0.876	0.179	1.075	0.295
12	Staff turnover	.113	.585	0.026	0.194	0.848
13	Delay in obtaining surface rights for the contractor to take over	1.212	0.576	0.260	2.104	0.048
14	Abnormal weather condition	-0.709	0.707	-0.147	-1.003	0.328
15	Conflict, dispute and strike	1.412	0.642	0.305	2.199	0.040
16	Rejected work	-0.738	0.790	-0.116	-0.935	0.361
17	Failure to pick mistakes and discrepancies on design document	0.153	0.579	0.033	0.264	0.794
18	Poor cooperation with the consultant	0.923	0.640	0.175	1.441	0.165
a. Dependent Variable: **cost**						

According to the study, the following regression coefficient shows that time factors such as client does not follow the right channel of communication (p= .004), Staff rotation on project (p=.040), delay in obtaining surface right for the contractor to take over (p= .048), conflict, dispute and strike (p= .040) are the most predictable factors to cost performance.

4.8 Cost Factors Based on Time Performance

In order to find the most predictable factors to time performance based on cost, a linear regression procedure was performed. The results are summarized in the following regression tables below.

Regression Model and ANOVA

The Regression Model and ANOVA is a model good for giving predictions and it is statistically significant. The R value is 0.840 indicates a higher level of correlation between time and cost. The R^2 value (the "**R Square**" column) indicates how much of the total variation in the dependent variable, time, can be explained by the independent variable, cost. In this case, 70% (0.705) can be explained as very large.

In order to test which cost factors are mostly associated with time, a regression coefficient procedure was performed. The results are in the Tables 18 and 19.

Table 18: Regression Model and ANOVA

	Model R	R Square	df	Anova F	Sig
	0.840	0.705	11	5.430	0.002
Regression 1868.226			25		
Residual 781.88			36		
Total 2650.10					

Table 19: Coefficient to the Regression Model on Cost

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	30.868	9.676		3.190	0.004
2	Inacurate project cost estimate	-.114	1.270	-0.012	-.090	0.929
3	Poor cost control	1.564	1.058	0.171	1.478	0.152
4	Price increase of resources	-.270	1.600	-0.026	-.169	0.867
5	Changes in material type	-2.134	1.697	-0.172	-1.258	0.220
6	Change of scope of work	-2.583	1.515	-0.259	-1.705	0.101
7	Redoing of work due to abnormal weather conditions	3.716	1.772	0.290	2.097	0.046
8	Interest charged due to deployed payments	1.680	1.178	0.198	1.425	0.166
9	Clients failure to give clear instruction s	.111	2.067	0.009	0.054	0.958
10	Encountering claims due to Clients delayed decisions	-1.003	2.102	-0.068	-0.477	0.638
11	Incompetent practitioners	-0.239	1.498	-0.025	-0.160	0.875
12	inability to foresee risks	6.747	1.828	0.600	3.691	0.001
a. Dependent Variable: **time**						

The study reflects regression coefficient showing cost factors such as, redoing of work due to abnormal weather conditions (p= .046), inability to foresee risks (p=.001), are the most predictable factors to time performance.

4.9 Summary of findings

The Roads Department has a group of professionals, project managers, project officers and their respective project team members, responsible for effective execution of projects, efficient time and cost performance being the vital expectation in the Department. The input of the professionals in RD plays a vital role on the expected end results. Frimpong, (2003) commented that many project managers of construction industries have recently started to utilize innovative time and cost impact assessment methods that provide new incentives for improving construction quality. He went on to say that these emerging strategies place an

increasing pressure on decision makers in the construction industry to search for an optimal resource utilization plan that would minimize time and cost while maximizing its quality.

4.9.1 The Main Survey

From the responses given, it has been observed that the identified time and cost factors are impacting implementation of projects in RD, negatively causing time and cost overruns and posing poor performance in time and cost control, hence poor project delivery.

According to the findings, factors rated 55% and above were found significantly severe in causing time and cost overruns and are given below:

a) Time factors

The delay in decision making, has rated 73.7%. This delay could be caused by the top management of the Department together with the project managers. Delay in decision making hampers the progress of the project in that sometimes a decision has to be made as to whether work should continue or not and awaiting the decision; if not taken timeously, time gets lost and may not be recovered.

Poor involvement of top management in project implementation is contributing to time overruns by 70.0%. This factor can be very cancerous to the development of the organization because top management is the vision holders of the organization, so if their involvement in the core business is poor, it would result in the slow death of the Department.

Ineffective planning and monitoring by the project managers and the projects officers has rated 68.4%. This factor is posing a need to take serious attention because there is no how the project would succeed without effective and proper planning. This factor has been identified by some authors to be contributing to time and cost overruns in projects. Ballard & Howell, (1998) argued that this factor is one of the major causes of delay in construction projects since ineffective planning results in durations of activities being under-estimated and poorly scheduled. Even though the consultant is vested with the authority of managing the projects, the client should also have a plan to follow to assist in project managing and monitoring.

Absence of project management tool to follow has contributed to time overruns by 65.7%. This factor plays a paramount role in ensuring successful project and if the Department does not have one to use, the future of the projects will remain blurred and this means that the RD

should ensure that there is a tool being used for attainment of expected results in the project implementation.

Bureaucracy is negatively affecting the smooth flow of projects in the public sector and the findings show that it is affecting RD by 63.2% which is found significantly high. Even though there is little that can be done on those procedures and policies governing public sector, but on those issues that affect it internally, effort should be taken to closely assess and reduce the negative impact that is being experienced on the project's progress.

Staff rotation contributes to time overruns by 63.1%. A project is one endeavor that requires owning up, buying it and running with it from its inception to completion. If the rotation of staff is made, then no one would own the project and this effect would be seen in its poor delivery.

A delay in processing payments is contributing in causing time overruns by 62.1%. This factor is internally influenced and this means that the Department should establish where the problem is commonly found in the payment process and rectify it.

b) Cost factors

Inability to foresee risks has rated 73.7% in contributing to cost overruns in the projects. This factor shows that there is a need to put in place the database for lessons learned as it would be a tool to guard against repeated mistakes.

Encountering claims due to client's delayed decision attributed 71.1% to cost overruns. The client should treat the projects with due diligence as they are the assets of the Department and these projects determine its ability and sustainability.

Inaccurate project cost estimate have caused cost overruns by 71.0% in Departmental performance. An estimate is the mirror image of budget for the project and if it is not done accurately, that result in the reality will fall far away from the estimate or the budget of the project. This shows that it is very important to produce an estimate that almost tallies with the project cost.

Price increase of resources contributed 71.4% to cost overruns. This factor comes out very crucial to the success of project performance as it affects the project externally. When price

of resources increases and the contract is not a fixed price contract, the client is left with nothing but complying with the circumstance at hand.

4.9.2 The Statistical Survey

a) The survey shows that in extracting time factors only six met the cutoff point i.e. were found having high influence in causing time overruns. These are poor involvement by top management in project implementation, staff rotation on projects, delay in process payment, bureaucracy, ineffective planning and monitoring and client does not follow the right channel of communication. These constitute 71.3 % of variance to the time factors. These are the top six factors that ranked high, severe and significant.
b) According to the survey, in extracting cost factors, only four factors met the cutoff points and were found to be the most severe and significant. These are inaccurate project estimate, price increase of resources, inability to foresee risks and encountering claims due to client's delayed decisions. They constituted 67.1 % of variance to the cost factors.

It can be concluded that the visual and statistical observations did not vary much in providing the results, as they constituted almost the same factors when picking the highest ranked factors that were found significant and severe to the time and cost performance in road projects.

It has been noted on Pearson Correlation Analysis that there is a strong positive correlation between time and cost. The Pearson Correlation Value of 0.695 with double star means that the two factors are highly correlated and their association is significant as the p value is 0.000 which is lower than the required significance of $p<0.05$

Through regression coefficient, the study showed that time factors such as client does not follow the right channels of communication (p= .004), Staff rotation on project (p=.040), delay in obtaining surface right for the contractor to take over (p= .048), conflict, dispute and strike (p= .040) are the most predictable factors to cost performance while on the other hand cost factors such as, redoing of work due to abnormal weather conditions (p= .046) and inability to foresee risks (p=.001), are the most predictable factors to time performance.

CHAPTER FIVE: CONCLUSION, RECOMMENDATIONS AND MEASURES

5.1 Introduction

This chapter gives the conclusion and recommendations of the study that was conducted to evaluate the factors causing time and cost overruns in road projects in the Roads Department, Botswana. This study has established the level of significance and severity of the factors. It is found out that there is time and cost factors that are severe to the project performance and require action and measures to eliminate or minimize significantly for expected project delivery.

5.2 Conclusion

Botswana is the fastest growing economy in Africa where construction industry is contributing significantly. Nevertheless poor time and cost performance on projects is still posing a setback and is a major problem faced by today's construction industry of which Botswana is no exception. This study was therefore necessary.

A structured questionnaire was given out to 38 practitioners in the Department. Analysis was carried out through visual observation and statistically using SPSS software package. Also mitigation measures to improve time and cost performance on road projects were developed based on the findings. Major factors were ranked according to their frequency and severity and only those rated 55% were considered to be of high significance and severe and as such require assessment. Time factors found to be severely causing overruns were delays in decision making that rated 73.7%, poor involvement of top management in project implementation rated 70.0%, ineffective planning and monitoring at 68.4%, absence of PM tools to follow at 65.7%, bureaucracy at 63.2%, staff rotation at 63.1% and delay in processing payments at 62.1%; while factors causing cost overruns were found to be inability to foresee risks at 73.7%, price increase of resources at 71.4%, encountering claims due to client's delayed decisions at 71.1% and inaccurate project estimate at 71.0%.

Finally, delay in project completion is common in road projects in the Roads Department. It is imperative to create awareness of the extent to which delays can adversely affect project delivery with regard to time and cost. Forecasting project cost performance is of paramount importance to the project control process in the construction industry. In making profits,

today's construction organisations, e.g. the Roads Department, requires an ability to predict project performance effectively and taking cognisance of best value for money timeously. Therefore, necessary timely corrective actions need to be taken on projects against time and cost overruns.

5.3 Recommendations

Passed researches had recommended the following:

- Need for team building
- Great integration of skills especially at early stage of project planning and design development
- Effective construction management at corporate, process, project and activity level should be introduced to professionals to enhance construction industry performance.
- Adequate coordination should be given the level of importance it deserves as it involves identifying strategic activities and potential delays and ensuring timelines of all works; This coordination also include having regular meetings, project reviews and analyzing the project performance, detecting variance and dealing with their effects at regular basis.
- It is very important to take time during design to produce a more complete set and expected documents.
- Project control methods during design should follow a trend towards user defined criteria, third part quality checks, established design criteria for progress review milestones, coordination between design disciplines and site establishment, drawing control and monitoring of design progress.

Recommendations made on the time and cost factors are as follows;

5.3.1 Time Factors

a) **Delay in decision making**

This is one of the important factors which when carried out effectively determines the positive progress of the project. This delay, if not eliminated through training and relevant disciplines, can result in a negative norm that will corrode the organization steadily. It exhausts the projects' money without a course. The mindset of decision

makers should be changed for the better so that they take cognisance of the fact that they are also project implementers whose prompt attempts in solving projects problems become a gain in organizational integrity.

b) Poor involvement of top management in project implementation

This is one factor that can be very dangerous to the development and sustainability of the organisation if not taken care of. Top management should set the pace, should put forth guidelines towards maintaining successful project delivery. In doing that they motivate their subordinates and ensure diligence, effectiveness and efficiency in project delivery. As such, it is recommended that this factor be closely treated and put to order with set guidelines to follow.

c) Ineffective planning and monitoring

Good management is vital to successful completion of projects. Before the project starts, it is necessary to plan how it is going to be carried out and this will ensure that all the project activities are carried out as planned and are being monitored accordingly. It is very important to execute the work that you have planned because implementation becomes the reality of what you planned; hence, monitoring will also become smooth.

d) Bureaucracy (official procedures and administration)

The Roads Department being a public sector does not control itself; there government procedures that are governing the way things should be done. But since the personnel working in the Roads Department is familiar with how the public sector works, this means proper planning by the project team should be made to cater for any situation that would bring bottleneck to the smooth running of the project. Involvement of top management in project execution would assist in the smooth progress of projects.

e) Staff rotation

This factor affects the project implementation negatively as the respondents have rated it high. One of the principles of project success is to maintain the same staff on it to its completion as it takes time for a new member to come into the project, familiarize him/herself with it while time is running out. The same personnel can be found better than the new ones as they know the history of the project and if they have problems, they could be assisted and move on with it; even if it means promotion. There should be a supporting regulation in the Roads Department that discourages staff rotation.

f) Delay in processing payments

This is one of the crucial factors that, if not taken care of, results in the project incurring additional costs in the form of interest on the failure to pay the interim certificate on time. This factor is contractually supported and as such, requires that close attention be paid to ensure timeous payments to the contractor. Delay in processing payments to the contractor results again in the contractor suspending works and attracting claims of violating the contract. It is therefore very important to ensure that payments are made to the contractor as per the contract as it can be seen that this factor is double faced, resulting in poor time and cost performance.

This means that the project manager and the project officer should ensure that no delay is experienced in paying the contractor. Even if it means making prior arrangements or plans to mitigate this factor, they should be made.

5.3.2 Cost Factors

a) Inability to foresee risks

This factor becomes the backbone of the organization becoming better through learning from past experience. The Roads Department must ensure that all the lessons learned on the project being implemented are being recorded properly so that they become effective tools of reference for future projects. If this factor is dealt with effectively, it should give a trend towards better project implementation. This tool would assist the Department for better project delivery. Time and cost overruns would be minimized significantly through using this tool.

b) Encountering claims due to client's delayed decisions

The client should realise that it is very crucial to make decisions timeously as this does not only bring delays but also have cost implications. Decision makers in the Roads Department should be trained on this issue of promptness as they will realize again that it does not show professionalism to fail to take timeous decisions.

c) Inaccurate project cost estimate

The high rating of this factor shows that the Department, the budget for projects comes out less than the actual amount to carry out these projects. This translates that there should be training to assist staff on the proper way of estimating project costs.

d) Price increase of resources

This factor directly affects the smooth progress of the project and it requires that with reference to past experiences on the material price behavior, best precautions be taken.

5.4 Mitigation Measures

5.4.1 Mitigation measures to improve time performance

a) Understand your needs well to avoid too many changes during project implementation.
b) Ensure proper planning of work so that its monitoring and work clarity will be easy.
c) Maintain close monitoring
d) Leadership and management of Roads Department should be committed to projects.
e) Ensure clear and traceable communication for effective and efficient output.
f) For effectiveness and efficiency, minimize or avoid rotating staff on implementation stage of projects to maintain responsibility, accountability and better follow up of the same project manager and officer.
g) Train and develop all project participants to support delivery process.
h) Be cognisance of project delivery.
i) Ensure that new construction technologies are used in the Department; hence adoption of tools and techniques to achieve expected results.
j) Record lessons learned on time performance on every project execution to avoid repeated mistakes on future projects.

5.4.2 Mitigation measures to improve cost performance

a) Ensure strategic planning
b) Maintain proper project planning
c) Use up to date technology monitoring project costs
d) Maintain timeous payments to the contractor
e) Ensure clear and traceable communication for effective and efficient output.
f) Acquire a comprehensive contract administration.
g) Ensure systematic control mechanism.

h) Record lessons learned on cost performance on every project execution to avoid repeated mistakes on future projects.

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APPENDIX A: MAP OF BOTSWANA SHOWING ROADS INFRASTRUCTURE UNDER RD

The road network in 2011

APPENDIX B: HISTORY OF TIME AND COST PERFORMANCE ON PROJECTS SINCE THE YEAR 1999 TO 2012

	Project	Company Grade	Length Km	Start date	Contract finish date	Actual finish time	Initial Duration (Months)	Actual duration (Months)	Time overrun (Months)	% time overrun	Initial contract cost(Million Pula)	Actual contract price	Cost overrun	% cost overrun	Comments
3	Kudumatse Drive	E	8.80	15/06/00	10/09/01	08/01/02	15	19	4	27	49.9	63.7	13.8	28	
4	Airport Circe - Rasesa Section I	E	19.80	18/07/00	15/12/01	14/05/02	18	23	5	28	58.9	65.262	6.362	11	
5	Airport Circe - Rasesa Section II	E	20.20	10/01/02	20/11/03	12/09/03	22	20	-2	-10	98	96.738	-1.262	-1	
7	Dikabeya - Kgagodi Reconstruction	E	38.00	16/10/04	08/02/05	15/04/05	16	18	2	14	17.87	18.829	0.959	5	
8	Mahalapye - Machaneng	E	71.00	01/04/98	08/10/99	31/05/00	18	26	8	44	45.7	47.44	1.74	4	
9	Ramokgonami-Moshopha	E	25.80	20/06/01	20/10/02	10/01/03	17	19	3	17	21.3	25.122	3.822	18	
10	Machaneng - Sefhare	E	20.40	20/06/01	20/09/02	22/01/03	15	19	4	28	13.565	13.503	-0.062	0	
11	Chadibe - Mokobeng	B	10.50	20/06/01	25/07/02	15/11/03	13	28	16	127	6.844	6.864	0.02	0	
12	Sefhare - Chadibe	B	10.80	20/06/01	04/07/02	22/01/04	12.5	31	19	151	7.633	8.594	0.961	13	
13	Mokobeng - Ngwapa	B	10.30	20/06/01	04/07/02	10/02/03	12.5	20	7	59	8.98	9.877	0.897	10	
14	Mahalapye - Kalamare	E	40.00	10/01/07	09/07/08		18				76.762				On-going
15	Metsemotlhabe - Kopong - Lentsweletau	E	40.90	10/10/98	10/10/00	15/12/00	24	26	2	9	40.5	48.349	7.849	19	

16	Sefhophe - Zanzibar	E	72.50	01/11/01	31/05/03	15/10/03	19	24	5	24	61.9	71.02	9.12	15	
17	Molepolole - Lephepe	E	150.00	10/05/99	10/06/01	15/09/01	24	27	3	13	85.6	108.266	22.666	26	
18	Dikabeya - Kgagodi - Matolwane	E	16.00	17/09/01	17/11/02	13/12/02	14	15	1	6	16.82	16.155	-0.665	-4	
19	Matolwane Junction - Moremi	B	9.40	17/09/01	17/08/02	16/06/05	12	46	34	287	8.09	7.571	-0.519	-6	
20	Lecheng - Malaka	C	13.30	17/09/01	17/11/02	13/12/02	14	15	1	6	10.45	10.245	-0.205	-2	
21	GooTau - Manaledi	B	4.91	17/09/01	17/08/02	18/11/02	12	15	3	26	4.91	6.031	1.121	23	
22	Mokungwane - Matlhakla	C	7.90	20/06/02	20/08/02	30/06/04	14	37	23	162	11.42	12.745	1.325	12	
23	GooTau - Sekgweng	B	4.20	20/06/02	20/07/02	31/07/04	13	38	25	190	3.31	4.164	0.854	26	
24	Mhalapitsa	B	5.20	20/06/02	20/07/02	01/02/04	13	32	19	144	3.542	5.567	2.025	57	
25	Mogobane - Ranaka - Kanye	E	44.45	15/06/02	14/12/03	18/03/05	18	33	15	85	44.3	54.756	10.456	24	
26	Kanye Link, Ranaka Loop & Lekgolobotlo	C	14.54	28/11/02	27/11/03	15/11/04	12	24	12	98	9.711	8.134	-1.577	-16	
27	Ramonogeng - Loop	B	5.59	12/03/03	12/03/04	15/09/04	12	18	6	52	5.86	5.236	-0.624	-11	
28	Ntlhantlhe Loop & Magotlhwane Access roads		7.37	09/05/05	08/05/06		12				8.84				The Contractor was liquidated

29	Jwaneng-Sekoma	E	84.00	14/09/01	13/05/03	11/12/03	20	27	7	35	54.24	69.63	15.39	28	
30	Middlepits - Bokspits	E	150.00	28/02/06	27/08/08						200.702				
31	Letlhakeng - Dutlwe Section I	E	121.00	24/03/03	24/02/05	18/11/05	24	33	9	37	151.446	143.203	-8.243	-5	
32	Ditshegwana	B	4.30	09/02/04	08/11/04	28/04/05	9	15	6	63	4.394	3.85	-0.544	-12	
33	Sesung	C	12.35	23/01/04	19/02/05	28/05/05	13	16	3	25	12.506	10.113	-2.393	-19	
34	Mahalapye - Palapye	E	70.00	10/06/00	10/01/02	15/09/02	20	28	8	41	57.5	75	17.5	30	
35	Tewane	B	5.60	15/10/00	15/06/01	10/08/01	8	10	2	23	3.8	4.047	0.247	7	
36	Radisele - Mogome	B	11.40	10/03/01	10/03/02		12				7.6				Terminated
37	Palapye - Serule	E	70.00	10/06/02	10/02/04	20/04/05	20	35	15	73	99.4	102.957	3.557	4	
38	Mopipi - Rakops	E	62.00	07/02/05	09/10/06	21/04/07	20	26	6	32	98.1	104	5.9	6	
39	Serule - Tonota	E	64.00	15/08/01	15/01/03	09/08/03	17	24	7	40	89.39	94.513	5.123	6	
40	Mandunyane - Semotswane	B	5.00	27/05/02	26/01/03	07/10/03	8	16	8	106	4.94	4.94	0	0	
41	Gojwane	E	0.40	14/10/02	14/05/03	14/05/03	6.7	7	0	0	6.88	6.785	-0.095	-1	
42	Mogojogojo - Mathethe	E	22.20	27/11/00	27/11/01	19/09/01	13	11	-2	-18	17.028	14.424	-2.604	-15	

43	Rakops - Khumaga	E	74.22	24/11/98	24/07/00	10/02/02	20	39	19	94	59.87	75.023	15.153	25	
44	Khumaga - Motopi	E	73.40	10/01/99	10/09/00	10/03/01	20	26	6	30	40.49	53.3	12.81	32	
45	Palapye - Martins Drift	E	80.00	09/10/97	09/04/99	08/06/99	16	18	2	13	47.187	47.155	-0.032	0	
46	Lecheng	B	9.20	01/07/99	30/04/00	20/10/00	10	16	6	58	5.411	5.164	-0.247	-5	
47	Pilikwe	B	11.00	01/07/99	30/04/00	18/09/00	10	15	5	47	6.067	5.311	-0.756	-12	
48	Sekgweng-Ramokgonami-Maape	E	22.00	01/07/99	30/06/00	15/12/00	12	18	6	47	12.992	13.659	0.667	5	
49	Nata - Kazungula		135.00	18/05/09	19/05/12										on going
50	Francis town - Ramokgwabana	E	78.80	29/09/08	28/09/10	30/12/10	24	27	3	12	386	415	29	8	
51	Sua Junction - Sua Pan	D	40.00	18/05/09	17/10/11										on going
52	Tsabong - Bokspits	E	100.00	15/01/08	14/01/10	31/7/11	24	27	3	12	272	332	60	22	
53	Kang - Huluntsi	E	115.00	01/05/09	07/05/11	30/09/12	30	44	14	47	536	400	-136	-25	
54	Gaborone-Tlokweng B/post	E	22.00	05/08/08	29/02/11	14/12/12	30	51	21	70	381.6	438.8	57	15	
55	Molapo Crossing - Metsimotlhabe	E	14.00	10/08/08	10/08/10	03/04/12	24	41	17	41	400	609	209	52	
56	Ngoma - Kachikau	E	38.00	27/2/09	26/08/10	20/07/11	18	28	10	71	186	198	12	6	
57	Ratholo,Moeng, Majwaneng&Seleka	E	39.00	25/05/99	24/05/00	04/08/00	12	14	2	17	23.46	24.46	1	4	

58	Tsabong - Middlepits	E	160.20	28/02/06	27/08/08	02/02/10	30	48	18	60	200.7	228.7	28	14	
59	Gantsi-Sehitwa	E	186.00	01/09/98	19/03/01	31/07/01	30	34	4	13	146.655	160.269	13.614	9	
	Sum						889.70	1 267.20	419.50	2 676.99	4 233.07	4353.47	414.11	426.62	
	Average						16.79	25.34	8.39	53.54	78.39	87.07	8.28	8.53	
	Standard deviation						5.96	10.31	7.70	56.35	117.08	132.59	37.71	16.70	
	Max						30.00	51.00	34.47	287.22	536.00	609.00	209.00	57.17	
	Min						6.70	6.70	-2.30	-17.69	3.31	3.85	-136.00	-25.00	

APPENDIX C: QUESTIONNAIRE EVALUATING THE FACTORS CAUSING TIME AND COST OVERRUNS IN ROADS PROJECTS IN ROADS DEPARTMENT, BOTSWANA

This study is for Master's Degree in Project Management (MPM) in Civil Engineering Department at the University of Botswana and is soliciting your professional opinion and comments on my research project questionnaire survey; with respect to the above-mentioned subject. Your cooperation and sincerity would be highly appreciated.

Optimum confidentiality will be exercised on the information provided and it will be exclusively used only for an academic research project report conferred with the University of Botswana. Results of this research questionnaire will be vital for the purpose of good performance towards time and cost, by professionals involved with roads construction projects in Roads Department, Botswana including the national construction industry as a whole. You are therefore requested to indicate your field of operation/expertise/practice (Project Manager, Project Officer, Top Manager, Project Team Member) by ticking on the appropriate box, as well as your work experience (practice) duration. The other personal particulars may be provided optionally.

Field of Expertise/Practice (please tick box):

Project Manager: ☐

Project Officer: ☐

Project Team Member: ☐

Other (please specify) _____

Work Experience Duration (Practice): _____

Name of Professional: _____

Position Held (Post in Practice): _____

Date/Year of acquiring the position: _____

Number of projects managed (Either in Roads Department or outside) _____

QUESTIONNAIRE TO THE RESPONDENTS

Project management, with its three constraints becomes one vital tool to improve the performance of projects establishment from inception stage to close out throughout the construction industry. Its proper utilisation causes it to be more effective and more efficient for better end results. Project management, like any other form of governance, brings with it the necessary element of administration needed to control the project on time and cost. It cannot be separated from managing the whole organisation. Good project management brings upon step changes in performance, it delivers evolutionary improvements.

Time and cost are the components of project management and hence good performance in them imply the effective and efficiency in management of roads projects.

Botswana as a developing country is still facing many problems on achieving expected results regarding time and cost performance in construction projects. There can be various reasons that are leading to this shortfall. It should be noted that each drawback may be influenced by the role that the concerned party is playing in the project implementation. As a result, this study is focusing on the extent the client is contributing to poor time and cost performance in roads projects in Roads Department, Botswana.

The factors below are divided into two, being those causing cost overruns and those causing time overruns. The respondent should tick the extent of harm which the factor is causing to project performance.

Rank the below listed factors causing failure in time and cost performance in roads projects in Roads Department, Botswana.

No.	Factors causing time and cost overruns	Very High	High	Moderate	Low
COST OVERRUN FACTORS					
1	Inaccurate project cost estimate				
2	Poor cost control				
3	Price increase of resources				
4	Changes in material type and specifications during implementation				
5	Change of scope of work				
6	Redoing of works due to abnormal weather conditions				
7	Interests charged due to delayed payments				
8	Client's failure to give clear instructions				
9	Encountering claims due to Client's delayed decisions				
10	Incompetent practitioners				
11	Inability to foresee risks				
TIME OVERRUN FACTORS					
1	Ineffective planning and monitoring				
2	Absence of project management control tool to follow				
3	Poor contract management by the client				
4	Poor involvement by top management in project implementation				
5	Delay in decision making				
6	Bureaucracy				
7	Delay in processing payments				
8	Client not following the right channel of communication at construction site				
9	Staff rotation on projects				
10	Shortage of practitioners				
11	Staff turn over				

12	Delay in obtaining surface rights for the contractor to take over				
13	Abnormal weather conditions				
14	Conflict, disputes and strikes happening due to some omissions by the client				
15	Rejected work				
16	Failure to pick mistakes and discrepancies in design documents				
17	Poor cooperation with the consultant				
18	Poor cooperation with the contractor				
19	Contractor's poor cash flow due to delay in making payments				