The influence of unrealistic initial contract duration on time performance of construction projects in South Africa

Amanda Viola Mavasa

Student number: 315782

Final submission submitted in fulfillment of the requirements for the Master's Degree, MSc (Building) in the field of Project Management in construction.

School of Construction Economics and Management at Wits University

Supervisor: Dr. Stephen Allen

September 2017

DECLARATION

I, Amanda Viola Mavasa, student no. 315782, declare that;

The research hereby submitted by me for the Master's Degree, MSc (Building) in the field of Project Management in construction at the University of the Witwatersrand is my own work and has not been previously submitted by me at another academic institution. I further cede copyright of the thesis in favour of the University of the Witwatersrand.

Signed ……. Date …….

Amanda Viola Mavasa

ACKNOWLEDGEMENTS

Firstly, I wish to express my gratitude to my supervisor Dr. Stephen Allen for his guidance in every step throughout the research study.

Secondly, I would like to thank the All respondents who participated in the research for their remarkable support throughout the research study.

Lastly, I would like to thank friends and relatives for their invaluable support offered for the study and their constant sacrifice and encouragement and prayer for God's wisdom, knowledge and understanding that helped me to complete this research study.

DEDICATION

I dedicate this research to my parents Elvis Mavasa and C.P. Mavasa, and to my sisters and friends who supported and encouraged me during the study.

ABSTRACT

The construction industry in many countries is faced with challenges when it comes to construction project delivery and this may be due to various factors, which are identified in the research. (Memon, *et al* ,2010), categorized the challenges faced in the construction industry as; delays in completing projects on time, expenditure exceeding budgets as well as poor quality.

The purpose of the research is to determine the impact of unrealistic initial construction programmes on time performance on projects. The research Investigates how project managers or project planner determine the initial construction periods. Investigate how the three industry participants i.e. the contractor, the consultants, and the client contribute to project delay due to unrealistic construction time periods. And further investigates what can be done to assist inexperienced consultants in determining construction time periods.

This study addresses factors that affect project time performance, with the focus on the initial estimated contract duration. A mono method quantitative research was selected and used, to identify the factors that affect timely completion of projects. 33 out of 70 respondents responded to the questionnaire. Through the analyses of questionnaires, the research reports on how industry professionals use existing construction guidelines in determining the construction duration as well as the impact of programming on project performance.

From numerical data obtained from the respondents, 43% believes that the client determines the construction duration, while 38% says it's the consultant project manager and only 14% says it's the contractor. The client, through his representative determines the construction duration. There are no regulated or standardized guidelines for determining the construction duration, this is dependent on the project managers experience. Though there are other factors that causes construction delays, and not specifically the initial programme, all these factors can be directly linked to this programme.

TABLE OF CONTENT

LIST OF FIGURES

LIST OF TABLES

LIST OF ANNEXURES

LIST OF ABBREVIATIONS

CIDB	- Construction Industry Development Board
CII	- Construction Industry Indicators
PMI	- The Project Management Institute
PMBOK Guide	- The Project management Body of Knowledge guide
ANS	- American National Standard
PMPAC	- Project Management Performance Assurance for construction
CSF	- Critical success factors
ACPM	- Association of Construction Project Managers
SPSS	- Statistical Package for Social Sciences
CIPS	- The Chartered Institute of Procurement and Supply
WI	- Works Information
JBCC	- Joint Building Contracts Committee
GBA	– Page 57
FTA	- Federal Transit Administration
CIP	- Capital Improvement Plan

CHAPTER 1: INTRODUCTION

1.1. Background

The construction industry is important for the development of any nation; hence construction activities have a direct impact on the economic growth of the country. The pace of economic growth may be measured through the development of physical infrastructures, such as buildings, roads, and bridges. Both the private sector and the public sector contribute greatly through the involvement of numerous stakeholders, using different processes at different stages of work, to ensure project success (Takim, *et al,* 2002).

In a study conducted by (Islam, *et al,* 2015), investigating causes of delay in construction projects in Bangladesh, three common causes of delay that contributes to the increased time period in the construction schedule were identified by three groups of respondents to the questionnaire, that is the consultants, the client or the owner and contractor, they all agreed to the following causes of delays: lowest bidder selection, lack of experienced construction manager as well as shortage of funds from the client.

The client and the consulting engineers identified inaccurate cost estimation, lack of an experienced consulting team, improper planning and scheduling, improper progress monitoring and control as the most important causes of delay in construction projects. The contractor and the consultants both agreed an incorrectly conducted feasibility study is another important cause of construction project delay. Similar findings were observed from studies conducted in Vietnam, Malaysia, and Saudi Arabia (Islam, *et al,* 2015).

1.2. Problem Statement

The Construction Industry Development Board (CIDB), states that all procurement documents should include requirements for delivery periods or initial construction duration. Depending on the type of project, different stakeholders determine this construction duration, using the available information at the time. Where the available information is insufficient, the scheduler will determine the duration using their own individual experience on similar projects (CIDP, 2015). Inexperienced consultants often underestimate the project duration, resulting in project delay.

1.3. Research question

How does the initial construction programme impact the eventual completion period of a project?

1.4. Research Aim

The purpose of the research is to determine the impact of unrealistic initial construction programmes on time performance on projects.

1.5. Objectives

1. Investigate how project managers or project planner determine the initial construction time periods.
2. Investigate how the three industry participants i.e. the contractor, the consultants, and the client contribute to project delay due to unrealistic construction time periods.
3. Investigate what can be done to assist inexperienced consultants in determining construction time periods.

1.6. Report Structure

This report will adopt the following structured breakdown:

Abstract

The abstract is a summary of the research proposal, which presents a brief introduction to the problem and provides a summary of how the research problem will be addressed.

Chapter 1: Introduction

Introduces the research question and outlines the path the research takes to reach its conclusion. It is structured as follows:

- Background to the Research
- Problem Statement
- Research Aim and Objectives
- Structure of the Dissertation

Chapter 2: Literature Review: Reviews the body of knowledge developed during previous research. It comprises of:

Introduction

- Project performance
- Construction project scheduling/ Programming
- Construction Project delay

Chapter 3: Research Methodology: Explains the methods used in this research to collect and analyze data to achieve the aim and objectives of this study. The following are discussed:

- Research Methodology
- Research Philosophy
- Research methodological Choice
- Techniques and procedures
- Data collection
- Data Analysis Methods

- Site or population selection
- Ethical considerations

Chapter 4: Presentation of results and findings

Data analysis comprises the results of applying the research methods adopted in this study.

Chapter 5: Summary of findings, conclusions, and recommendations

Conclusions are gathered from the data analysis and the recommendations made are based on these conclusions.

CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

Schedule overrun is a common problem in construction projects worldwide and often result in project delay. Project delays result from factors, which are explored in literature below. A construction schedule is a list of construction activities, used to coordinate diverse activities in a construction project and is prepared by a project manager or a scheduler. Schedule overrun is when a project is completed beyond the scheduled period (Luu, Kim, *et al*, 2009).

(Wortham, 2005) identified two types of construction delays: non-excusable and excusable delays. Non-excusable delays are those delays that are within the control of the contractor, the consulting team or the client. Excusable delays are delays that are not foreseeable, beyond the project stakeholders control and take place without fault or negligence from the stakeholders. Examples of non-excusable delays are: Underestimate of production rates, inadequate scheduling or management, construction mistakes, equipment problems, bad luck, liquidated damages or termination of the contract to mention a few. Examples of excusable delays are: unusually Severe Weather, changes and extra work, differing Site Conditions, delays from unforeseeable causes beyond control of the Contractor, labor disputes, utilities, etc. (Wortham, 2005)

2.2. Project performance

Project performance may have one or more sets of indicators, which are influenced by various project characteristics (Pheng, *et al,* 2006). Performance may be viewed through two common sets of indicators by the parties involved in the project, the macro viewpoint and the micro viewpoint depending on how the different parties benefit from the project. The owner, the users, stakeholders and the general public will look at project performance from the macro viewpoint, while the developer and the contractor will look at project performance from the micro viewpoint.

Performance indicators for benchmarking projects should be identified at the project selection phase, in order to achieve good project performance. A major decision for a project such as project objectives and planning for project execution strategies are taken during the origination and initiation phase of a project and have the most influence on project success. (Dvir et al., unpublished paper, 2002), established that what the project team produces during the analysis stage determines the entire development process output. A construction project is usually divided into activities, to simplify execution, these activities follow a different sequence, some activities take place after other activities have been completed, and some activities start at the same time. The sequence is defined in the project management manual for scheduling.

Planning for each construction stage is important to avoid project failure or project delay, (The procurement guideline for consulting engineers, 2011), where the stages are discussed in detail. Decisions that affect the overall project are taken in each construction stage. These individual stages are elaborated upon in more detail below:

- The first stage is the **inception stage** – The project manager or the client's representative assist the client in the following activities: establish client requirements and preferences, assess user needs and options, appointment of necessary consultants, establish the project brief including project objectives, priorities, constraints, assumptions aspirations, and strategies

- The second stage is the **concept and viability or preliminary design stage** – The appointed consultants prepare and finalize the project concept in accordance with the brief, including project scope, scale, character, form, and function, plus preliminary programme and viability of the project

- The third stage is the **design development or detailed design stage**, the appointed consultants develop the approved design concept to finalize the design, outline specifications, cost plan, financial viability and develop a programme for the project

- The fourth stage is the **documentation and procurement stage**, where consultants prepare procurement and construction documentation, confirm and implement the procurement strategies and procedures for effective and timeous procurement of necessary resources for the implementation of the project.

- The fifth stage is the **contract Administration and inspection stage**; consultants manage, administer and monitor the construction contracts and processes including preparation and coordination of procedures and documentation to facilitate practical completion of the works

- The sixth stage is **Close-out**; consultants ensure that the necessary documentation to enable effective completion, handover and operation of the project are provided for and signed by the relevant parties.

2.2.1. Factors that affect project performance

(Enshassi, *et al*, 2009), in their investigation of factors that affect the performance of construction projects in the Gaza Strip, identified ten (10) factors that affect project performance.

1. Cost factors
2. Time factors
3. Quality factors
4. Productivity factors
5. Client satisfaction factors
6. Regular and community satisfaction factors
7. People factors
8. Health and safety factors
9. Innovation and learning factors
10. Environmental factors

The contractor, the client, and the consultants agreed that from the ten factors identified, the most important factors that affect project performance are delay, disputes and claims. Project delay is affected by time performance; this is when the project is not performing in accordance with the scheduled period, (Enshassi, *et al,* 2009). Consultants also observed that availability of personnel with high qualifications and the quality of equipment and raw materials used in a project strongly affects the quality performance of a project.

2.2.2. Performance Indicators

Project performance is measured and evaluated using performance indicators which could be related to different groups. (Cheung, *et al,* 2004), identified eight groups of performance indicators that can be used to measure performance, that is; time, cost, quality, client satisfaction, client changes, business performance as well as health and safety. The three most predominant performance indicators are time, cost and quality. (Din, *et al*, 2010), in a study conducted to explore the relationship between an ISO 9000 certified quality management system and elements of performance in construction project environments, identified three elements of performance, that are related to time quality and cost i.e. Project management practices, Financial Management practices, and Project success.

The CIDB uses the CIDB construction Industry Indicators (CII) to measure the performance of the construction industry in South Africa, with the main focus on the perception of the client, contractor and the consultants. The 2015 annual report shows the following results: the client's dissatisfaction with the contractor's performance has decreased by 4% from 12% in 2013 to 16% in 2014. The levels of client's dissatisfaction and contractor's dissatisfaction are higher in large projects and increase with the project size. Client dissatisfaction is said to be a result of appointing contractors that are not suitable for the work. Around 85% of South African tenders in the construction industry are evaluated based on functionality, taking into consideration the bidders technical capacity, as well as the ability to execute the contract, as advocated by the CIDB, however, according to the (CII report, 2015) the recommendations of the tender

adjudication committee, were overruled in the award of a tender by 12% of public sector projects.

Performance indicators are affected by contractors, consultants, and the client. Client satisfaction is the fourth most important measure of performance and is affected by cost, time and quality, amongst others. Client satisfaction is the contractor's ability to execute and complete a project within the specified period and to the required expectations of the client and is used as a measure of contractor's performance (CIDB, 2015)

(The CIDB: Construction indicators summary results, 2015), assessed performance of the consultants, contractors, and the client, on projects with a value between R1 million and R100 million, the following results were obtained: from projects surveyed in 2015, client satisfaction on performance of the consultants was 83%, on 17% of the projects the clients were neither satisfied nor dissatisfied. It was also observed that client satisfaction has decreased over the years, from 87% in 2012 to 83% in 2015. The CIDB also reported that a decrease in client satisfaction with the consultants was directly proportional to the increase in project size.

Furthermore, client's satisfaction with the overall performance of the contractors on projects surveyed in 2015 was at 82%, on 18% of the projects, clients were neither satisfied nor dissatisfied, they were neutral. These results show a noticeable decrease from 88% in 2013 to 82% in 2015. Client satisfaction with the performance of the contractor was lowest in the Western Cape, Free State, and Northern Cape. The survey also shows that the decrease in client satisfaction was affected by the increase in the size of the project. The levels of client satisfaction with the contractor's performance were higher in the public sector than in the private sector, (the CIDB: Construction indicators summary results, 2015).

Client's performance is also important to the contractor to ensure effective and efficient delivery of projects on time and within budget. According to the CIDB CII, 2015, the contractor was also not satisfied with the client's performance on around 20% of the

projects surveyed. The contractor was dissatisfied with the quality of tender documents and specifications, management of variation orders and payment delay. One of the major challenges facing small and medium sized contractors in the contracting sector is delayed payments, and it often results in the bankruptcy of a contractor.

2.2.2.1. Project management practices

Projects and Project management has been defined by various researchers, (The Project Management Institute (PMI), 2015) defines a project as a temporary effort undertaken to create a unique product, service or result. (Dvir, *et al,* 2003), in agreement with other authors, also defined a project as a unique effort or a special task that have not been done before.

(The British Standards for project management BS6079, 1996) defines project management as the planning, monitoring and controlling of all aspects of a project and the motivation of all involved in the project to achieve the project objectives on time and to the specified cost, quality, and performance (Atkinson 1999). (The PMI, 2015) defines Project Management as the application of knowledge, skills, tools and techniques to project activities to meet project objectives.

PMI was established in 1969, in the USA, where they issued publications on project management, until 1980, where the project manager's accreditation scheme was established for project management professionals. The Project management Body of Knowledge guide (PMBOK Guide) was later published in 1980 and was approved by the American National Standard (ANS) as a standard for project management. For the purpose of this study, the PMI definition for project management has been used.

Since projects are unique, it is very difficult to determine all activities to be carried out, the cost involved to complete the activities as well as the duration parameters. However, an experienced project team can determine a reasonable estimate for a project at the initial planning stage. A project manager is selected by an organization to manage and control the project as well as to ensure that the project meets its intended objectives. Selecting

a competent project manager is very important for the successful completion of a project. The project manager's position is important, especially in complicated projects (Belassi, *et al,* 1996).

The skills, commitment, experience, authority and characteristics of project managers affect the project manager's performance in a project and hence affect the overall project success. The project manager's competence affects the project planning, scheduling, and communication, making the project manager a key stakeholder in a construction project. (Belassi, *et al,* 1996).

Where resources and time are limited, the project manager must be able to control all potential risks, manage different activities properly in consultation with the relevant consultant, and make decisions on the general matters of the project (Belassi, *et al*,1996). (Dvir, *et al,* 1999), In a study to investigate development in Israel, found that the preparation of formal design and planning documents has a strong positive effect on meeting the project's time and budget objectives, and contributes to customer benefits from end products. The origination and initiation phase is where major decisions such as deciding the project's objectives and planning the project execution are made. These decisions have the most influence on project performance and the overall project success.

2.2.2.2. Financial Management practices

The functionality of projects has been compromised over the years, the procurement guideline for consulting engineers, 2011 observed that often clients depend on the financial offer alone, neglecting quality and functionality and hence award the tender to the lowest bidder. However, the client may not realize that the lowest bidder may not necessarily have the capacity to execute the project. The public sector is currently spending a lot of money in rehabilitation projects, as a result of poor quality. The cost associated with projects that are of a poor quality goes far beyond the cost price but also includes operating, maintenance and life cycle costs.

2.2.2.3. Project success

2.2.2.3.1. Quality Management

Quality is used as a measure of project performance in construction projects, to ensure project success. (Din, *et al*, 2010) established that project performance could be enhanced by developing a quality management system, which could be achieved when seeking ISO 9000 accreditation. (Bigger, 1990) define quality as the conformance to established requirements, which are derived from customer specifications or scope of works, engineering codes, and standards, as well as self-imposed requirements. Peoples different attitudes and beliefs towards quality often change over the development life-cycle of a project, (Atkinson, 1999).

In South Africa, 82% of projects completed in 2015 were delivered up to the clients expected the quality standard, 18% of the projects were neutral or dissatisfied with the quality of work handed over by the construction team. These results represent a significant decrease in the satisfaction of the client compared to 2013 survey results, where client satisfaction was at 90%. Client satisfaction with the quality of work handed over in the public sector was lowest in the Western Cape and Free State, (the CIDB: Construction indicators summary results, 2015).

The Manufacturing industry could enhance performance through the certification movements, such as lean production, ISO 9000, in-time. The construction industry was challenged to adopt ISO 9000 practices, to ensure continuous customer satisfaction, as well as continuous improvement. ISO 9000 certification is linked to quality management systems, and is believed to have over the year's enhanced organizational development and contributes to project performance (Schlickman 2003). Organizations created and implemented management tools or quality programmes which form an integral part of Quality management, however, the programmes are usually lacking in customer satisfaction and quality improvements, as different customers have different needs (Bigger, 1990).

Design for Quality ensures that requirements implemented are satisfactory and this is achieved through Quality Management. Quality management is the implementation of the management tools or systems in a construction project (Bigger, 1990). The initial application or rather the adoption of Quality Management systems by the construction industry was not easy, as the manufacturing industry and the construction industry are very different in nature and in practice. In the 1990s the construction sector was known for poor performance, with issues identified such as lack of project management experience, skills, knowledge, ineffective tendering methods and poor communication methods. However, Quality management systems were effectively applied in construction projects and the desired outcome was achieved, (Serpell, 1999).

Though Quality management systems are said to enhance project performance, and eventually affects project success, performance management should not be limited to the development of Quality management systems, but should also incorporate other factors such as; the establishment of processes for managing relationships on projects through partnership approach as well as dealing with external environment such as price fluctuations (Serpell, 1999). Planning for projects is also very important when initiating a project, to ensure project success, though planning, if not done together with other factors that influence project success may not guarantee project success, but may guarantee project failure (Dvir, *et al,* 1999).The Project Management Performance Assurance for construction (PMPAC) model was established to enable better performance in construction project environments through incorporating all factors that affect project performance.

2.2.2.3.2. Project success criteria

Due to the unique nature of construction projects, there is more than one way to evaluate project success; therefore, the success criteria used in each individual project will differ from project to project. In a case study, conducted by (Chan, *et al,* 2004) to develop a conceptual framework of critical success factors (CSF), five factors were identified as influential to critical success factors (CSF) from seven journals in the construction field.

These factors are; Project-related factors, human-related factors, Project procedures, project management actions and external environment.

Project success has been measured in the past based on the three attributes that are found within the definition of project management, i.e. schedule, budget and performance objectives (Dvir, *et al,* 1999). Many authors have argued what project success is and whether the definition of project success should be limited to only time, cost and quality (Shenhar, *et al,* 2001). The three success measures are still at most limited, even when they are all considered at the same time. Measuring project success by only time, cost and quality may only be appropriate in certain projects and inadequate in other projects. Projects such as the Sydney Opera House which was delayed by over three times the original scheduled period, with the cost at almost five times higher than the estimated construction cost is now regarded as one of the most successful projects in terms of functionality, and has become one of Australia's most famous landmarks (Shenhar, *et al,* 2001).

(Slevin & Pinto 1986); (Morris & Hough 1987) and (Turner 1993), define the most common success criteria for construction projects as that projects are delivered on time, within budget, to technical specification and meet the client's satisfaction. (Wateridge 1998), on the other hand, argues that success criteria for construction projects are infect much wider, as they incorporate the performance of the stakeholders, evaluate their contribution and understands their expectations. Measuring the success of a project by only time, cost and quality was found not to be the best way to measure success, hence (Dvir, *et al,* 1999), in their empirical analysis of the relationship between project planning and project success, determined four success measures that are highly inter-correlated, to ensure that projects are successful for all stakeholders in a specific project. The success measures are meeting planning goals, end-user benefits, contractor benefits and overall project success.

2.2.2.3.3 Project success measures

(Din, *et al,* 2010) in agreement to (Dvir, *et al,* 1999) suggested that project success cannot be limited to a single definition as different people assess the success of a project in different ways. A single project may have many different stakeholders, who would each define project success differently, according to their overall benefit from the project. Industries also have different criteria in defining project success; therefore, success criteria vary from project to project (Din, *et al,* 2010). (Heerkens 2002) suggested four levels of success measures to summarize project success criteria.

- The first level is meeting project targets, which refers to the original project objectives of delivering the project on time, within budget, to meet the required quality standards and functionality.
- The second level is project efficiency; this refers to the way the project was managed.
- The third level is customer or user utility which refers to the extent that the project satisfies its end-users needs.
- The fourth level is an organizational improvement.

Previous research has revealed that in cases where the project was delayed and took longer than stipulated to complete, severe criticism of the construction industry would arise. Completion of projects on time is seen as an indication of an efficient construction industry and is regarded the most important criterion of project success (Welamila & Hall). Quality of management during construction directly affects completion time, through inadequate supervision levels, ineffective coordination of resources and activity sequencing (Aiyetan, *et al,* 2012)

The quality criteria for construction work in South Africa are described by the CIDB as per the following list:

- *Quality control/health and safety / environmental practices and procedures which are geared to satisfying stated requirements*

- *Technical approach/methodology / proposed programme to satisfying stated employer's objectives/managing project risks Demonstrable capability to mobilize own, hired and subcontracted resources in projects of a similar nature*
- *Qualifications/experience of staff allocated to the project/availability of skills to manage and perform the contract (assigned personnel) Experience (track record) on previous contracts of a similar nature, scope or complexity (over the last five years).*
- *Availability of equipment and personnel required for the project and contingency plans.*
- *Management structure and resources allocated to the contract*
- *Time to practical completion*
- *Aesthetic (design and construct / develop and construct contracts)*
- *Functional characteristics (design and construct / develop and construct contracts)*
- *Projected life cycle costs of the works (design and construct/develop and construct contracts)*

(The CIDB: Construction indicators summary results, 2015)

2.3. Construction Project scheduling/programming

A construction schedule is developed in a deterministic manner, used to coordinate the diverse activities found in a construction project to ensure successful execution of a project (Luu, et.al, 2009). Due to the nature of the construction industry, risk and uncertainty are unavoidable in all construction activities and hence the schedule of works also contains significant uncertainty. Schedule delays are therefore common in construction projects worldwide and result in considerable losses to project stakeholders (Luu, et.al, 2009).

On Project surveyed in 2015, Clients were satisfied with 74% of the projects that were completed within the tendered construction schedule, this excludes the time allocated for variation orders. 26% of the projects were not completed on time and the clients were neutral or dissatisfied. Client satisfaction decreases significantly from the 2012 results.

(Aiyetan, *et al,* 2012), suggest that certainty in project duration is fundamental in construction projects, to ensure project completion, however, the estimation of project duration has been inaccurate, therefore a study to investigate the relationship between initial and final contract time was conducted. From a sample population of architects, contractors, quantity surveyors, structural engineers as well as the client, within five (5) Metropolitan cities, a model, and linear equation for estimating building construction period was developed.

Australia, Malaysia, The UK and Hong kong, developed statistical models for predicting the duration of a construction project. These models were based on the project scope factors as primary variables. The models determined the construction duration by taking into consideration the construction cost, gross floor area, the size of the building or the project complexity level, as well as management attributes, such as the effectiveness of communication of decision-making among contracting parties (Walker & Vines, 2000; Walker, 1994).

2.3.1. Impact of scheduling/programming on project performance

Due to the competitiveness of the construction industry, the price of a project, as well as the duration, has been used as a competitive advantage amongst contractors to secure work within the public sector. This has however affected and compromised the quality of work delivered. Though the construction period is determined by the consultants, the schedule is produced by the contractor based on the period specified by the consultants. Most contractors tend to use unrealistic time frames on activities, to reduce the overall construction period. On most public projects, the client works on a budget provided for that specific financial year (Frimpon, *et al,* 2003)

It is common in most construction projects for the client and the consultants to want to accelerate the project and complete the project before the appropriately specified period; in this case, a contractor with a reduced construction period is most likely to get the project. In this case, the client will budget based on the new construction schedule

provided by the contractor. Where the contractor fails to deliver the project within the scheduled time, the project is considered delayed. Though other factors may have contributed to the project delay, the initial schedule has a significant impact on the project (Nepal, *et al,* 2006)

Financial losses for project stakeholders result from construction project delays. Project stakeholders should be able to predict possible construction schedule delays to limit or even eliminate project delays and hence improve the chances for success on construction projects (Luu, Kim, *et al*, 2009).

2.4. Construction Project Delay

Schedule overrun is defined by (Mohamad, 2010) as an act or event that extends the time it takes to complete or perform an act under the contract. (Assaf & Al-Hejji, 2006) also defined schedule overruns as the time overrun beyond the specified completion date or beyond the date that the parties agreed upon for delivery of a project. Construction schedule overrun is considered a common problem in construction projects worldwide.
Schedule overruns occur when a project is not delivered within the scheduled period to the client and are a result of construction project delay. Construction project delay is defined as the time overrun, where a project is completed beyond the date specified in the contract document or beyond the date that the parties to the contract have agreed upon for delivery of a project (Islam, *et al,* 2015).

Construction project delays affect all key players or stakeholders such as the client, the consultants and the contractors in a construction project, however, the consequent impacts of such delays are not understood. Construction schedule overrun is a common problem in all parts of the world and many construction projects experience schedule overruns, which subsequently increases the project cost and thereby reducing profits. (Semple, *et al,* 1994; Amhel, *et al,* 2010; Abdul-Rahman & Berawi 2006; Gündüz, *et al,* 2013).

2.4.1. Causes of project delay

A construction project may have different types of stakeholders. A stakeholder is an individual or a group of individuals which have a stake in the project or who can influence the construction performance, inside or outside the construction project. Examples of stakeholders include, but not limited to: the client, consultants, the contractor, the supplier the end-user as well as the community (Takim & Akintoye, 2002). These stakeholders share different opinions about the causes of delay. In a research conducted by (Assaf and Al-Hejji, 2005) to establish the causes of delay in construction project the following results were established: the client and the consultants have common views about the causes of delay. The owner/ client relates most of the causes of delay to the contractor and labor. However, the contractor indicates that the most frequent causes of delay are due to the client and the consultants. All parties agree that the most frequent causes of delay are due to the appointment of the lowest bidder, which may result in poor performance if the lowest bidder is unqualified and have low capabilities and a shortage of resources.

Original contract duration, as well as improper planning and scheduling, were identified as the main factor that causes project delay in construction. In a survey conducted in water drilling projects in Ghana, with a sample size of 47 projects completed between 1970 and 1999, it was found that 33 projects were delayed, while 38 were over-ran. This indicated that 75% of the projects exceeded the original project schedule and cost. (Assaf and Al-Hejji, 2006) also determined one of the most important causes of delay as inadequate planning and scheduling of projects by contractors. In South Africa, construction time predictions in construction projects are derived from the client's brief or derived by the construction planner, who uses available project data.

(Motab & Kishk, 2010), on an investigation into the causes and effects of construction delay in the UAE, identified 42 causes of construction delay and grouped them into 5 sets: contractors, consultants, project managers, and clients, financial and unforeseen factors. It was established that consultants and project manager’s contribution to time and cost

estimation, impacts on the overall duration of the project, leading to time and cost overruns. Other factors that affect project progress and intern leading to project delay, caused by consultants and project managers were identified as; poor site management and supervision, improper project planning and scheduling, incompetent project team as well as impropriate construction methods.

Project delay is influenced by many factors in a construction project, (Aiyetan, *et al*, 2012), in the study to investigate the linear regression modeling of the relationship between initial estimated and the achieved construction time in South Africa, cited other researchers who identified causes of project delay, and grouped them into twelve categories, under each category, sub-causes of delay were identified.

1. Client understanding of the design, procurement and construction processes
2. Quality of management during design
3. Quality of management during construction
4. Motivation of staff
5. Site ground conditions
6. Site access
7. Constructability of design
8. Management style
9. Management techniques used for planning and control
10. Physical environmental conditions
11. Economic policy
12. Socio-political conditions

These causes of project delay must be identified for each project during the initiation stage as they affect project cost and time overruns and they also impact on quality. (Memon, *et al,* 2010).

2.4.2. Effects of construction project Delay

(Motab & Kishk 2010) identified five effects of project delay in construction projects: time overrun, cost overrun, dispute and arbitration, legislation as well as the total abandonment of a project

2.4.2.1. Time Overrun

Over 90% of projects in South Africa do not get completed within the scheduled period and are said to have been delayed. Construction project delay eventually results in project time overrun. Construction project delay is not the same as time overruns, however, time overrun is an effect of construction project delay (Islam, *et al*, 2015). Time overrun has been defined by (Assaf & Al-Hejji 2006), as the delay in a construction project, where a project is completed beyond the specified construction period or beyond the date agreed by the contracting parties. The construction industry is subject to many variables that affect the efficiency of the project as well as the overall project delivery

Consultants and project managers rank time overruns as the first most important effect of delay, followed by cost overruns. (Motab & Kishk, 2010), in their investigation into that causes and effects of construction delay in the UAE, found that the causes of delay identified by the different stakeholders, the contractor, the client, the consultant and the project manager is comparable to the findings from past research on a similar topic, however, in addition to the findings identified by (Aiyetan, *et al,* 2012), five factors that can cause time overruns were identified. These factors include change orders, slow decision making by the client, lack of capability of the client representative, construction financial difficulties as well as late delivery of materials.

Time overruns have a negative impact on project delivery, and it can cause cost overruns as well as disputes among project stakeholders (Aibinu & Jagboro, 2002; Sambasivan & Soon, 2007). From a research project investigating cost overruns and the front-end planning process of megaprojects in the oil sands of Alberta, Canada (Jergeas, 2008), international senior project manager ownership, engineering procurement, and

construction organizations in different countries were surveyed. Causes for cost and schedule overrun were identified and classified into the following categories:

1. Unrealistic or overly optimistic original cost estimates and schedules,
2. Incomplete scope definition or inadequate front-end loading and poorly completed front-end deliverables, including milestone schedule slippage; and
3. Inappropriate project strategies for the mega–oil sands environment

2.4.2.1.1. Impact of Time overrun

Project delay or time overruns have serious implications on the project and the parties involved. The owner of the project may lose revenue, through lack of production, rental income, budget cuts on the following financial year due to the inability to spend the budget provided for that year. Construction delay may also affect the client's budget, leading to a loss of interest on cash withdrawn which would have been invested (Assaf & Al-Hejji, 2006).

Depending on the type of contract entered into, the contractor may lose through penalties. Some contracts, such as the JBCC provides that the contractor is liable for penalties. A Penalty is an amount agreed on the contract document payable to the client where the project is completed beyond the schedule period. Delay may also affect the contractor through increased overhead costs and inflation that leads to high material costs as well as high labor costs (Assaf & Al-Hejji, 2006).

Contractors often accelerate the construction project where they foresee a project delay to avoid penalties. Accelerating a project has cost implications; however, most contractors accelerate the project at no cost, thereby compromising the quality of the project. Quality may be compromised through overworking the labors and using inexperienced labor force as well as using cheaper materials, other than the materials specified. In a case of concrete structures, contractors shorten the curing periods to reduce the overall contract duration. This is a result of poor contractor management as well as poor technical performances which are affected by ineffective project planning in controlling and monitoring project performance.

2.4.2.2. Cost Overrun

There are external factors and internal factors that cause construction cost overruns in construction projects. External factors may be assumed and calculated, however, they cannot be controlled. The construction of the FIFA world cup stadia in South Africa, like most international and national projects, also experienced cost and time overruns. In a study by (Baloyi and Bekker, 2011) to investigate the causes of construction cost and time overruns, the following external factors were identified; increase in material cost and price fluctuations. The internal factors that cause cost overruns were identified as those factors that are influenced by the project team. These internal causes were poor bills of quantity estimate, material take-off, and delays in payment, poor planning as well as a shortage of skilled labor (Baloyi and Bekker, 2011).

In Malaysia large construction projects, ten causes of cost overruns were identified, that is; fluctuation of material prices, project cash flow, poor site management and supervision, lack of experienced project team, schedule delay, inadequate scheduling and planning, incompetent sub-contractors, design error, frequent change in design as well as poor management of finances on site (Rahman, *et al,* 2013). In addition to these causes (Ali & Kamaruzzaman, 2010) identified the following; inaccurate or poor estimation of original cost, inflation of project cost, poor project management, unstable construction equipment and methods, unforeseen site conditions and poor contract management as well as construction cost underestimation.

Nigeria, as a developing country, experience extensive delays in terms of cost and time overruns in construction projects. Studies revealed that this is due to the award of the lowest bidder to execute the project, which is more evident in the public sector projects (Ubani, *et al,* 2013). (Ubani, *et al,* 2013) suggests that an experienced engineer and construction team is essential for the development of a project, to give sound judgment in terms of the construction methodology applied. Cost overruns not only affects the client, the consultants or the contractor but for countries like Nigeria, where construction in important for employment and economic growth, cost overruns affect the development of the country. (Ogunsemi & Jagboro, 2006) suggests that the country needs to gear their

efforts towards improving construction efficiency through the application of cost-effective strategies that will contribute to cost saving for the country.

2.4.2.3. Dispute and Arbitration

Adjudication and Arbitration are different types of dispute resolution without having to include the traditional court. These rules are discussed in the GCC, FIDIC, JBCC, NEC3 respectively.

An adjudication is a form of dispute resolution which allows parties' access to an Adjudicator to resolve a dispute between parties in dispute. Disputes are adjudicated by a Dispute Adjudication Board. The decision of the Adjudicator or a Dispute Adjudication Board is binding and is final, however, where the parties are dissatisfied with the decision taken by the Dispute Resolution Board, Arbitration may commence. Adjudication is rapid and It does not interfere with progress on site. It is expected that in cases where certain expertise is required, the Dispute Adjudication Board or Adjudicator will consult others to provide such expertise (Sobel, 1996).

Arbitration, on the other hand, is a form of dispute resolution that is between the parties to a dispute and a neutral person or panel, chosen by the parties to hear and determine the dispute where the decision by the Dispute Adjudication Board was dissatisfactory. The arbitrator(s) have full authority to open, review and revise any certificates, determination, instruction, opinion or valuation of the Engineer, and any decision of the Dispute Adjudication Board. Arbitration is an expensive, time-consuming, formal procedure (Sobel, 1996).

2.4.2.4. Legislation

Where the parties to the contract fail to resolve the dispute through dispute resolution or arbitration, the parties may take the matter to the court. This is common in big projects where the penalties are large sums of money. Solving construction project issues using common legislation principles has over the years affected the overall construction project, unlike arbitration and dispute resolution; other projects have resulted in total abandonment of the project (Sunjka & Jacob, 2013)

2.4.2.5. Abandonment of a project

Failure to resolve contractual matters as well as a delay in project execution may lead to total project abandonment. Total abandonment of construction project is a serious problem. This matter arises mostly in projects where a large sum of money is involved. This affects not only the client but the contractors and the consultant's reputation and should be avoided (Sunjka & Jacob, 2013).

2.5. Conclusion

Construction projects are becoming more complex, and project teams are facing unprecedented challenges due to the dynamic nature of the construction industry. Rapid change in technology, budgets, competition as well as development processes influences increases in uncertainty, making the industry more complex and difficult (Chan, *et al,* 2004). (Wang, 1994) mentioned that due to the complex nature of the industry, stakeholders need to develop a refined approach that deals with initiating, planning, financing, designing, approving, implementing and project completion to limit the overall delay in construction projects and enhance project performance.

Project performance is affected by effective delivery of projects and has a positive impact on the firm's performance. An organization's lack of understanding for project success has led to inadequate quality control practices and a decline in quality standards. Most projects are conceived with a business perspective, and often with a goal that is focused on profit maximization, organizational growth, improved market position for competition purposes, as well as better results and organizational performance (Shenhar, *et al,* 2001). Performance management is essential in construction projects to ensure project success through the delivery of projects that have higher quality standards at budgeted construction costs.

CHAPTER 3. RESEARCH METHODOLOGY

3.1. Introduction

This chapter discusses the philosophical assumptions as well as the design strategy that supports this research. Common research philosophies were identified, and the Positivism model was identified for the framework of this research. In addition, the chapter discusses research methodologies and design used in the study including strategies, instruments, data collection methods and data analysis methods. A mono method quantitative research was selected and used; this method is properly discussed using literature. Questionnaires were used to establish how professional project managers or project planners determine the initial construction duration, and as well as the impact of poor scheduling on quality, time and cost. To collect data, telephone interview, personal interview as well as emailed questionnaires were used. The justification of the data collection methods used in this study was discussed.

3.2. Research Methodology

Research methodology is the science of studying how research is conducted scientifically to systematically solve the research problem through identifying the various steps taken when studying the research problem along with the logic behind the research problem. Research methodology is different from research methods or research techniques, and researchers ought to know both concerning their research. Research method refers to those methods a researcher uses when studying the research problem. "*It is the behavior and instrument used in selecting and constructing research techniques"* (Kothari, 2004). (Myers, 2009) suggests that the research method is a strategy applied to shift from underlying assumptions to research design and data collection. Research techniques, on the other hand, refers to the behavior and instruments used in executing research operations such as making observations as well as recording and processing collected data. It is important for researchers to determine the correct methods and techniques relevant for their research (Kothari, 2004).

3.3. Research Philosophy

Determining the correct research philosophy in research enables the researcher to choose the correct research methods when designing the research. Research philosophy provides structure, guidance and possible limitations to following decisions and ultimately the way a researcher can collect and analyze data to create valid findings. There are 6 philosophical stances, in which a researcher may choose from the most appropriate philosophy for their research, and these are Objectivism, Constructivism, Positivism, Realism, Interpretivism, and Pragmatism (Saunders, *et al*, 2013).

The philosophy of positivism is concerned with observing and predicting outcomes, similar to a law of generalization in science, such as for cause and effect, and hence often referred to as a scientific approach to research. A positivist approach enables the researcher to propose and test theories with data which are highly structured and usually measurable; therefore, the research is not influenced by the researcher's values. Positivism usually involves large samples of quantitative data as well as statistical hypothesis testing (Saunders, *et al*, 2013).

A realism approach is influenced by the researcher's experience as well as the world's views, Realism states that "*reality exists independent of the mind and that what a researcher's senses show her or him is the truth*". Realism is also a philosophical position associated with the scientific analysis. There are two forms of realism: direct realism and critical realism. Collection techniques, as well as analysis procedures, are varied using either qualitative or quantitative method, or both methods.

The philosophy of interpretivism relates to the study of social phenomena in their natural environment and is concerned with gathering insights into subjective meanings than providing law-like generalizations. The philosophy refers to approaches emphasizing the meaningful nature of people's participation in the social and cultural life and is said to be "*value Bound*". Data is collected and analyzed using a qualitative research method, from in-depth investigations with small samples.

Pragmatism argues that a single viewpoint cannot give the entire picture and that there may be multiple realities and hence research may be approached in two ways, both

constructivism and objectivism. The importance of research is said to be in the findings' practical consequences.

3.3.1. Positivism

A positivism philosophy may sometimes be referred to as "scientific method", or post-positivist. Postpositivist refers to the thinking after positivism, (Phillips, *et al*, 2000) suggests that one cannot be "positive" about their claims of knowledge when studying the behavior and actions of humans. Postpositivists are concerned with examining causes that influence outcomes. These factors may be related to issues examined in scientific experiments. Postpositivists aim to reduce the ideas into a small set of ideas that are tested, such as the variables that constitute hypothesis as well as research questions, while basing the knowledge acquired on careful observations and measurements of the objective reality that exists. A research that is based on a positivist approach requires the positivist to develop a numeric measure of observation as well as to study the behavior of individuals (Creswell, 2003).

According to August Comte, a French Philosopher, to obtain true knowledge, one needs to observe and reason, as these are the best means of understanding human behavior and may be obtained through observations and experiments. A positivism philosophy seeks to uncover what is true and to present the truth by empirical means. Positivists assume that knowledge is objective and quantifiable, as it is assumed that reality is objectively given and is measurable using properties that do not depend on the researcher's influence or instruments. Positivists quantify to improve accuracy when describing parameters and relationships to systemize the knowledge generation process (Henning, *et al*, 2004).

During the late 19th century and throughout the 20th century, the positivistic philosophy was associated with the quantitative and the qualitative approach. These included quasi-experiments, (true and less rigorous experiments), correlational studies as well as specific single-subject experiments (Campbell, *et al*, 1993). However, over the years, the approach to quantitative strategies has evolved and now involves complex experiments with many variables and treatments for various designs. This strategy also includes

elaborate structural equation models that incorporate causal paths as well as the identification of the collective strength of multiple variables (Creswell, 2003).

Table 3.1: Examples of advantages and disadvantages of a positivist philosophy

Advantages	**Disadvantages**
Economical collection of a large amount of data	Inflexible – direction often cannot be changed once data collection has started
Clear theoretical focus for the research from the outset	Weak at understanding social processes
Greater opportunity for the researcher to retain control of the research process	Often does not discover the meanings people attach to social phenomena
Easily comparable data	

3.4. Research Methodical choice

Qualitative research methods were first used in the natural science to study natural phenomena, while quantitative research methods were developed to assist researchers when studying social and cultural phenomena in social science. Both research methods are used in education and neither is basically better than the other. Only the context, the nature as well as the purpose of the research study in question can determine the suitability of the research method (Bryman, *et al* ,1999)

Choosing an appropriate research approach is largely dependent on knowledge claims, strategies and research methods used (Creswell, 2003). A researcher may choose to a quantitative research, qualitative research or a mix of both the qualitative and quantitative. Qualitative research has over the years been associated with a realistic philosophy, and hence reflects some sort of individual phenomenological perspective. While quantitative is associated with positivistic philosophy and tends to emphasize the common reality on which people can reach an agreement (Newman, *et al*,1998).

3.4.1. Quantitative Research

Quantitative research is a formal objective to a systematic process used to describe and test relationships as well as to examine and the causes and effects interaction among variables (Buns, *et al,* 1993). Quantitative research enables researchers to obtain information from a sample of individuals through self-report. Self-report is when people respond to a sequence of specific questions presented by the researcher (Politt, *et al*, 1993). According to (Creswell, 2003) quantitative approach is a research approach whereby the researcher uses a postpositivist claim to develop the required knowledge through the employment of inquiry such as experiments and surveys to collect data on predetermined instruments that produces statistical data. The postpositivist claims used include cause and effect thinking, reduction to specific variables, hypothesis and questions and use of measurement and observation as well as a test of theories.

A quantitative research approach assumes a common objective reality across individuals, unlike a reality. According to (Douglas, 1976) and (Geertz, 1973), multiple realities and multiple interpretations that are equally valid exist and are available from different people, this phenomenon is completely different if one functions from a positivist position or quantitative method. Quantitative research is categorized under empirical studies or statistical studies, this depends on the individuals, as different people classifies it differently. Where control of variables, randomization as well as valid and reliable measures are required and where generalizability from the sample to the population is the aim, different quantitative design methods may be applied. Quantitative design includes traditional ways where investigations were carried out in psychology and behavioral science, as well as studies such experimental studies, quasi-experimental studies, pretest-postest design and others (Newman, *et al,* 1998).

"*Quantitative research is based on the measurement of quantity or amount and is applicable to phenomena that can be conveyed and expressed in terms of quantity*" (Kothari, 2004). This research method may be subjected to severe analysis in a formal and rigid fashion as it involves generation of data in the quantitative form. This approach may be classified into three different approaches, that is, inferential, experimental and simulation approach to research.

- Inferential research - forms a database from which allows one to conclude the characteristics or relationships of a population. An example is a survey research where the population sample is studied to determine the characteristics, and it is then concluded that the population has the same characteristics.
- Experimental approach - the researcher has much greater control over the environment, where some variables are even manipulated to observe their effect on other variables.
- Simulation approach – an artificial environment is constructed, within which relevant information and data may be generated to understand future conditions. In business and social science, simulation is “the operation of a numerical model that represents the structure of a dynamic process. Given the values of initial conditions, parameters, and exogenous variables, a simulation is run to represent the behavior of the process over time” (Kothari, 2004).

3.5. Techniques and procedures - Data collection and data analysis

3.5.1. Determining Sample design

In a census inquiry, all elements of chance are considered and hence the highest level of accuracy is obtained. A census inquiry is a complete account of all items in a population. Population or sometimes referred to as a universe refers to all items in any field of inquiry. In practice, accuracy may not be obtained through a census inquiry as elements of bias will get larger and larger as the number of observations increase. Moreover, the only way of checking elements of bias is through a resurvey or sample checks, which is rarely done since it is an expensive exercise and time-consuming. A census inquiry is therefore not possible in practice, and hence, a few items from a group of items are selected for research purposes. The selected items constitute a sample (Kothari, 2004).

- **Deliberate sampling**

Deliberate sampling is where a researcher purposive or deliberate selection of items in the universe for constituting a sample which represents the universe, this method is also known as purposive or non-probability sampling. Convenience sampling is when population elements are selected based on ease of access. Convenience sampling may,

however, give bias results, especially if the population is not standardized. In qualitative research, where the aim is to develop a hypothesis, researchers tend to use judgment sampling to select items. Judgment sampling is used where the researcher selects a sample based on his or her judgment (Kothari, 2004).

- **Simple random Sampling**

Simple random sampling is where all items in the population have an equal chance of inclusion in the sample and all items of a possible sample have the same probability of being selected. Random sampling may be achieved through the adoption of a lottery system or using random number table. Random table sampling gives each item an equal probability of being selected (Kothari, 2004).

3.6. Data collection

There are two types of data that can be collected in a research, that is, primary data and secondary data. Primary data is data that is original, collected for the first time from a certain population group. Secondary data is data which has been collected by other researchers, and has passed through the statistical process; examples of secondary data would be a case study (Kothari, 2004). For the purpose of this research, primary data was collected and used.

3.6.1. Primary data collection

From data collected primarily through experiments or surveys; the researcher chooses the appropriate method for his or her research, based on budget, time and other resources available to the researcher. The researcher can choose whether to use a single data collection technique as well as the appropriate corresponding analysis procedure, which can be either a mono quantitative design or a mono qualitative design. Mono quantitative design is when data is collected using questionnaires and experiments and analyzed statistically, and mono Qualitative design is when data is collected through in-depth interviews and analyzed as narratives (Creswell, 2003). Experiments include true experiments, as well as quasi-experiments. True experiments uses a random assignment

of items, while quasi-experiments include single-subject designs, and uses nonrandomized designs (Keppel, 1991).

Primary data may be collected through experiments, observations, direct communication with respondents, or through personal interviews, depending on the nature of the research. The several methods of collecting data in surveys as well as descriptive surveys are as follows: Observation method, Interview method, interview through questionnaires, interviews through schedules, other methods which include warranty cards, distributor's audits, party audits, customer panels, using mechanical devices, depth interviews, and content analysis. For the purpose of this research and to efficiently address the research question and objectives, questionnaires are used.

Surveys include cross-sectional and longitudinal studies using questionnaires, personal interviews, and telephone interviews for data collection, with the intent to generalize information from a sample to a population (Babbie, 1990).

- Personal interview – The researcher seeks answers to a set of predetermined questions through personal interviews while following a rigid procedure. The output is largely dependent on the investigator's ability to investigate, as the interviews are structured (Kothari, 2004).
- Telephone interviews – The investigator contacts the respondents on the telephone to conduct the interview. This method is more effective in research where time is of importance (Kothari, 2004).
- Mailing of questionnaires - This method is the most extensively used method in most industries. Questionnaires are mailed to the respondents with a request to return after completion. The researcher and the respondents do not have to meet. The questionnaire used must be able to effectively collect the relevant (Kothari, 2004).

Questionnaires are the most widely used method of data collection as all respondents are asked to respond to the same set of questions, thereby, providing an efficient way to

collect responses from a large sample group before quantitative analysis. However, for questionnaires to be effective, they must be structured in such a way that one is able to collect the detailed data required to answer the research question and achieve the objectives (Bell, 2005). After observing all possible data collection methods, questionnaires were found to be the most appropriate for this study to properly address the research questions and objectives.

Questionnaires are applied in a predetermined order, where respondents are asked the same set of questions, for data collection. The questions are asked in a structured interview, telephone questionnaires, as well as emailed questionnaires, depending on the availability of the respondents (Saunders, *et al,* 2009). Structured interviews can include more complicated questions, and are most suitable in longer questionnaires than telephone questionnaires or self-administered questionnaires (Oppenheim, 2000), for this reason, structured interviews were only be conducted with individuals that are not able to do a self-administered questionnaire or a telephone interview.

When sending out questionnaires, it is important to ensure that the questions are interpreted the same way by all respondents, hence questionnaires do not work well for exploratory or other research that requires open-ended questions (Robson, 2002)

Questionnaires, therefore, tend to be used for descriptive or explanatory research. Descriptive research, such as that undertaken using attitude and opinion questionnaires and questionnaires of organizational practices, will enable you to identify and describe the variability in different phenomena. In contrast, explanatory or analytical research will enable you to examine and explain relationships between variables, in particular cause-and-effect relationships (Saunders, et al, 2009)

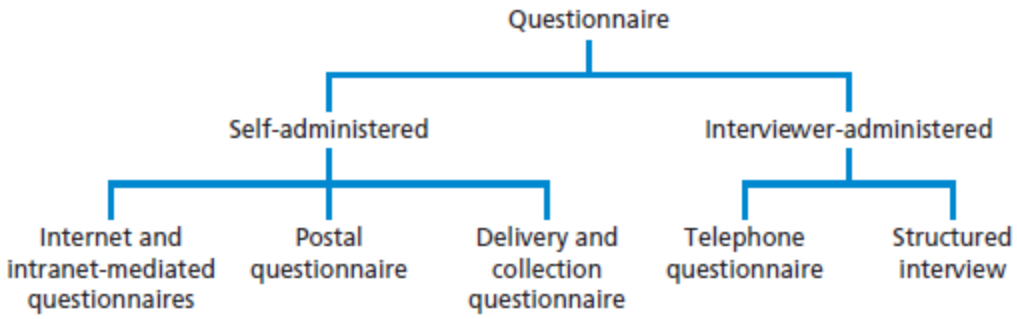


Figure 3.1: Structure of Questionnaires

The following factors were considered when drafting the questionnaires:

- The characteristics of the respondents
- Different methods to be used to reach the respondents to ensure participation
- How to avoid contamination of the respondent's answer
- Sample size required for analysis, while taking into consideration the response rate
- The type of questions needed to collect the relevant data
- As well as the number of questions that will adequately answer the research question

From research conducted by (Saunders, *et al*, 2009), it was found that questionnaires can affect the respondent rate. It was established that questionnaires that are administered in a form of an interview usually have a higher response rate compared to self-administered questionnaires, i.e. administered by the respondent. The manner in which a sample size is selected also affects the confidence one can have in the data collected as well as the extent to which one can generalize.

3.7. Data Analysis Methods

When quantitative data is collected from all respondents as per the prescribed data collection method, the data is said to be raw data. Raw data is data that has not been processed and analyzed, which expresses very little information to most people until it is processed. This processed data is then turned into information that is useful. For the purpose of this research, Quantitative analysis techniques such as graphs, charts, and

statistics were used to explore, present, describe and examine the relationship and trends within the data collected (Saunders, *et al*, 2009).

3.7.1. Statistical Techniques

The collected data were analyzed through the following statistical techniques and indices:

3.7.1.1. Rank

Ranked data is mostly used by researchers in rating or scale questions. Rating or scale questions are such questions where the respondent is asked to rate how strongly they agree or disagree with the question. Ranked data is regarded the most accurate form of categorical data therefore, when using ranked data, the researcher is able to identify the relative position of each case within the data set even when the scores on which the position is based are not recorded (Saunders, *et al*, 2009).

(Saunders, *et al*, 2009) noted that numerical data or quantifiable data is more accurate and not categorical, as each data value can be assigned a position on a numerical scale. Numerical data or quantifiable data is data whose values are measured numerically as quantities (Brown, *et al,* 2008). Numerical data can be analyzed using a far wider range of statistics, as this data may be sub-divided into interval or ratio data or into continuous or discrete data (Saunders, *et al*, 2009).

3.7.1.2. The mean

According to (Saunders, *et al*, 2009) the mean $\overline{X}$, sometimes referred to as the arithmetic average includes all data values in its calculations and is used as a measure of central tendency. The mean is used to explore relationships and is calculated using numerical data. The mean summarises the important features of a series and enables the data to be compared. For skewed distributions, the mean is less representative of the central tendency as it is highly influenced by extreme data values. For these distributions, the median is more useful (Anderson, *et al*. 1999). For the purpose of the research, the mean has been used to as a measure of central tendency.

3.7.1.3. The standard deviation

The standard deviation (σ) has been used to validate the extent to which the data values for a variable are spread around the mean (Saunders, *et al*, 2009).

3.8. Site or population selection

The study was carried out in the Gauteng province, in South Africa from a sample size of 70 professional Project managers, registered with the Association of Construction Project Managers (ACPM). A convenient sampling approach was used as the researcher is based in Gauteng, making it convenient and time effective to conduct research in this area. Gauteng province is also known as one of the provinces with rapid economic activity, which has subsequently resulted in high volume of construction projects taking place.

3.9. Ethical considerations

When conducting a, one must take into consideration that they are entering the private spaces of the participants to the research, which may raise several ethical issues during and after the research (Silverman, 2000). According to (Creswell, 2003) the researcher is obligated to respect the rights, the needs, the desires and the values of the respondents. Issues to be considered before, during and after the research, when analyzing data were identified by (Miles, *et al*, 1994) and are listed below, also listed is how these issues were addressed in the research:

- *Informed consent* – ensure that the participants to the research are well informed of what is involved. The participants must be informed of the purpose, the nature, data collection methods, as well as the extent of the research before commencement. Since face to face interviews were conducted with only participants that cannot be reached through emails or telephone, it is important to properly explain the participant's role. The informed consent was given to the participant prior to completion of the questionnaire in writing.
- *Harm and risk* – investigate whether the study can harm the participants in any way. The participants were given, in writing, assurance or guarantee that they will not be put in a situation where they might be harmed because of their participation neither physically nor psychologically.

- *Honesty and trust* – The researcher must observe strictly ethical guidelines of data collection as well as data analysis. The researcher was truthful to the participants when presenting the data.

- *Privacy, confidentiality, and anonymity* – Ensure that the participant's privacy is respected at all times and that the study does not interfere too much with the participant's behavior. Personal identification is not required to fully address the research problem and objectives.
- *Intervention and advocacy* – The researcher should be aware of how to handle participants that display harmful or illegal behavior

The researcher needs to ensure that the participant's privacy, confidentiality, dignity, rights and anonymity should be respected at all times, hence strict ethical guidelines should be adhered to. On the consent form, it should be made clear to participants that the research is only for academic purposes and that participants are not forced to participate in the study, participation is voluntary.

3.10. Conclusion

This chapter outlined the research philosophy, research methodology, the research strategy and design used, data collection techniques as well as data analysis methods. The research approach used is a deductive model that was analyzed largely through quantitative methods.

CHAPTER 4: PRESENTATION OF RESULTS AND FINDINGS

4.1. Introduction

This chapter presents the data analysis and discussions of the findings of the study. The main goal of the research was to establish the impact of unrealistic initial construction programmes on eventual time performance. A quantitative, positivist research method was used to collect data from respondents. To collect the primary data, 70 research questionnaires were distributed to project managers register with the Association of Construction Project Managers (ACPM) residing in Gauteng. The Council has over 500 registered industry professionals and out of the 70 questionnaires distributed, 33 were returned and regarded eligible for the aim of the analysis, representing 47% response rate.

The research findings for the study are presented using both tables and diagrams, and this was also influenced by the research question, objectives, data characteristics as well as the scale of measurement which the data was recorded. Quantitative data may convey very little meaning to the reader when it is not processed or analyzed as it is in raw form. To convert this data into useful information, quantitative data techniques such as graphs, charts, and statistics may be used. The techniques also enable the researcher to explore, present, define and review relationships and trends within the data (Saunders, *et al*, 2009).

Data was evaluated using the computer programmes, Statistical Package for Social Sciences (IBM SPSS) and Microsoft excel. The analysis consists of descriptive statistics in terms of percentages, ranking, mean scores and standard deviations. The mean was used to describe the central tendency and the standard deviation was used to describe the dispersion. The analysis is revolved around the objectives of the study, that is, to Investigate how project managers or project planner determine the initial construction time periods, to investigate how the three industry participants i.e. the contractor, the consultants, and the client contribute to project delay due to unrealistic construction time periods, to investigate the impact of poor scheduling on time as well as to Investigate

what can be done to assist inexperienced consultants in determining construction time periods.

4.2. Analysis of Demographic Characteristic of Respondents: Background Information

33 respondents contributed to the study. A set of questions were set to describe the demographic variables of the sample. Although the demographics are not part of the intent of the study, this information enables the researcher to evaluate for any effect on the study findings. The demographic data includes gender, age group, professional qualification of the respondent, highest qualification obtained, the length of time in professional practice and the number of projects the respondent was involved in.

As indicated in figure 1 below, most of the respondents are male, which represents 82% of the total persons who responded to the questionnaire and 18% were female.

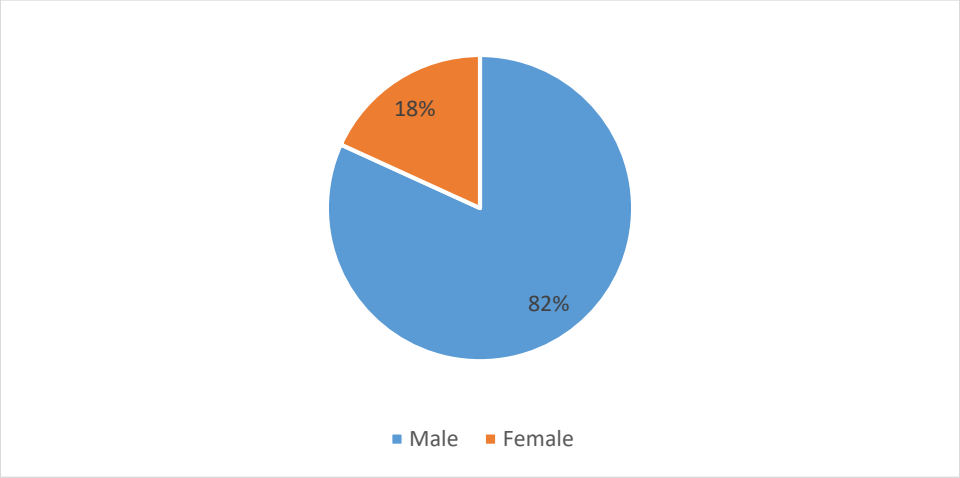


Figure 4.1: Respondents Gender

Findings relating to the respondents age group, as illustrated in figure 2 below shows that 15% of the respondents are between the ages of 20 and 30, 24% are between the ages of 31 and 35, 21% are between the ages of 36 and 40, 6% are between the ages of 41 and 45, 15% are between the ages of 46 and 50, 3% are between the ages of 51 and 55 and 15% are above 56 years old.

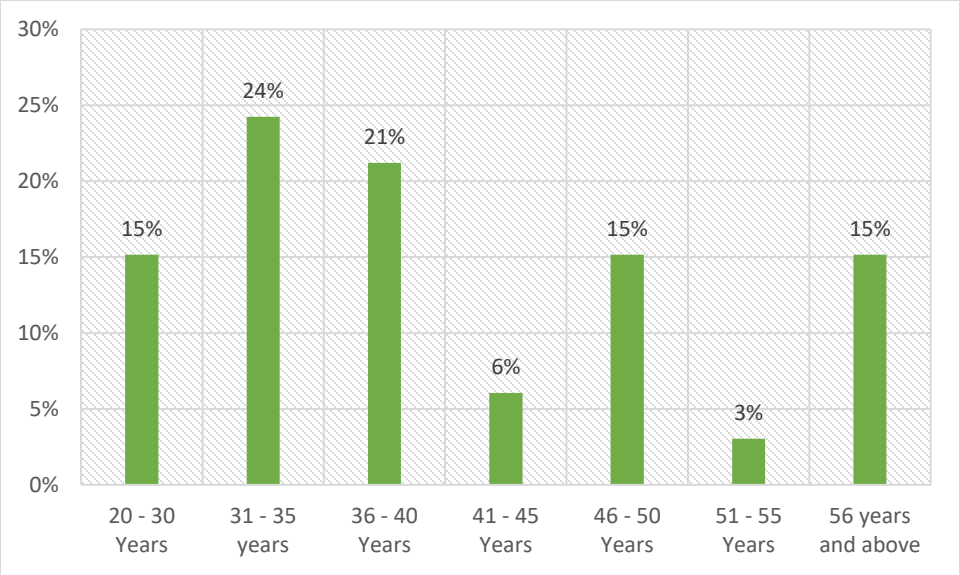


Figure 4.2: Age Group

Figure 3 below represents the professional qualification obtained by the respondents. It is clearly revealed in terms of respondent's profession that 10% have a Quantity Surveying qualification, 28% have engineering qualification, 31% are qualified as project managers, 15% are qualified as construction managers and 15% have other qualifications. Category F, (other) includes the following professional qualifications: Supply Chain operations, Development planning, Contracts Management, Development management and Property Valuation that is an add on to a first qualification. This section of the questionnaire has revealed that most industry professionals, working as construction project managers do not necessarily have a project management degree, however they have acquired other professional qualifications within the construction industry. Within the 15% respondents that have obtained other qualifications, 7% have obtained more than one professional qualification.

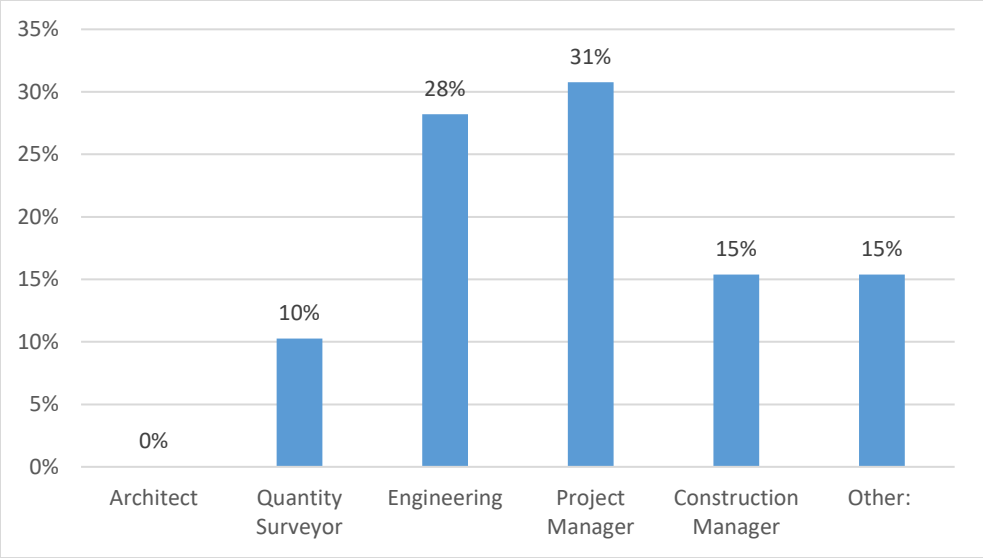


Figure 4.3.: Professional Qualification Obtained (Background)

All respondents to the questionnaire were found to have a form of qualification. Figure 3 below shows that only 3% of the respondents have Matric certificates (grade 12) as their highest qualification. 3% have a diploma as the highest qualification obtained, 59% have a Bachelor's Degree, 32% have a Master's Degree and 3% have other qualifications such as CIPS (The Chartered Institute of Procurement and Supply – Supply chain management). None of the respondents poses a Doctorate in the construction industry.

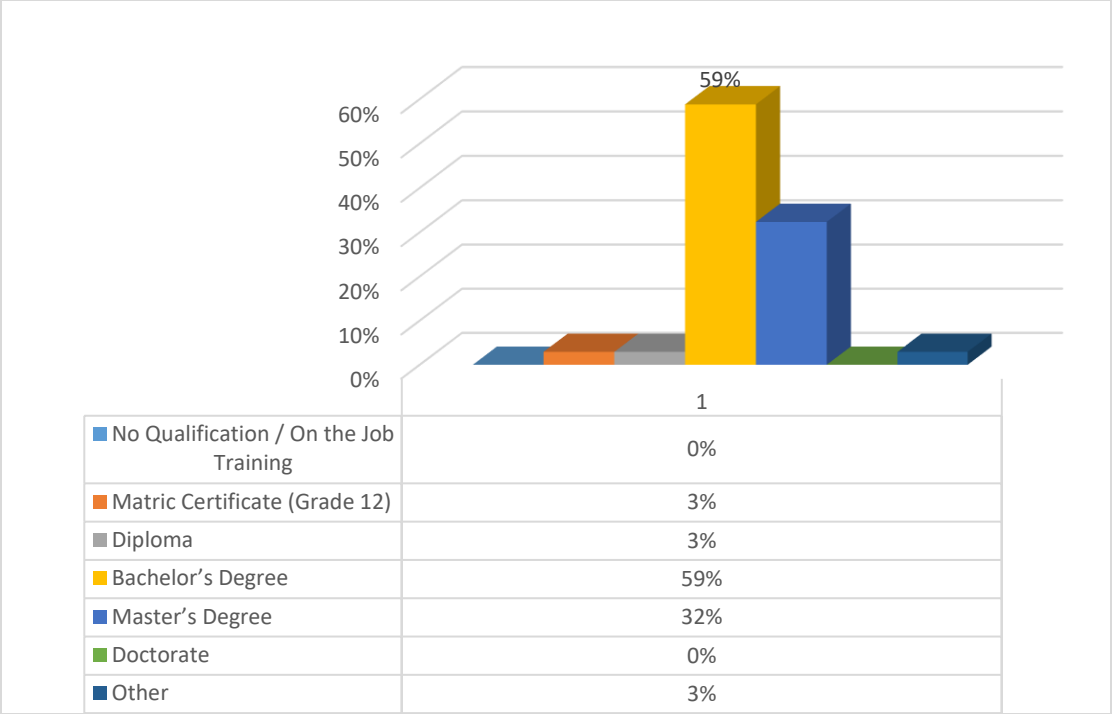


Figure 4.2: Highest qualification obtained

As indicated in figure 5 below, most of the respondents have less than 10 years of experience in the construction industry. 36% have between 6 and 10 years of experience, 15% have between 1 and 5 years of experience, 65 have between 11 and 15 years, 18% has between 16 and 0 years, 3% has between 2 and 25 years and 21% have between 26 years and above of experience in the construction industry.

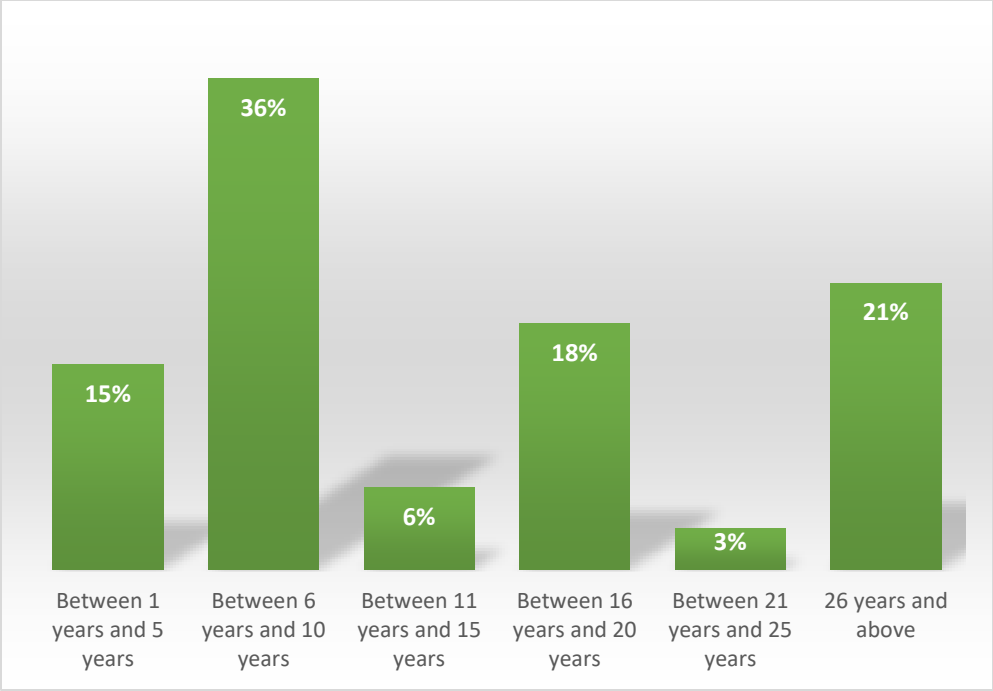


Figure 4.3: Years of Experience in the construction Industry

Most of the respondents have between 1 and 5 years of experience as project managers as indicated in figure 6 below. 12% of the respondents have over 26 years of experience as project managers. When comparing figure 5 and figure 6 it was observed that most consultants start off in other professions within the construction industry, and later work as project managers. Other consultants perform project management duties while also working as other consultants such as engineers, or quantity surveyors, this usually depends on the project the consultant is involved in.

Looking at the overall qualification obtained, experience in the construction industry as well as experience as project managers, it is clearly indicated that the majority of the respondents have had significant professional practice experience of more than 5 years. Over 67% of the respondents fall into this category which is vital when determining the reliability and credibility of the data gathered from the respondents.

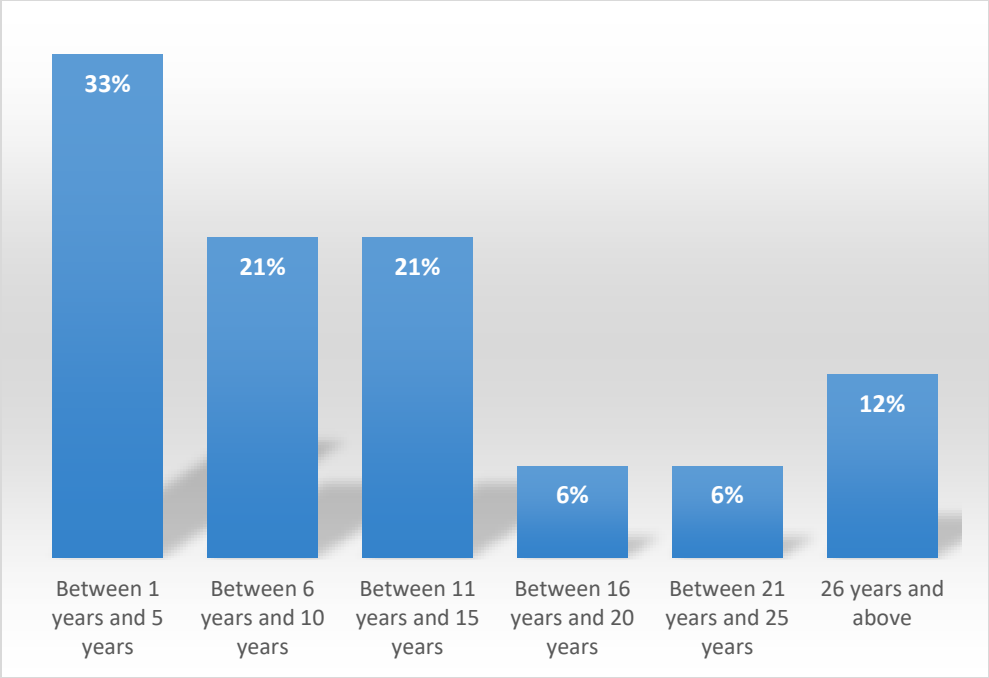


Figure 4.4: Years of Experience as a Project Manager

74% of the respondents are employed by the client as consulting project managers, working for the private sector in the construction industry. 15% are employed by the contractor, and 12 % are working for a Government organization as project managers.

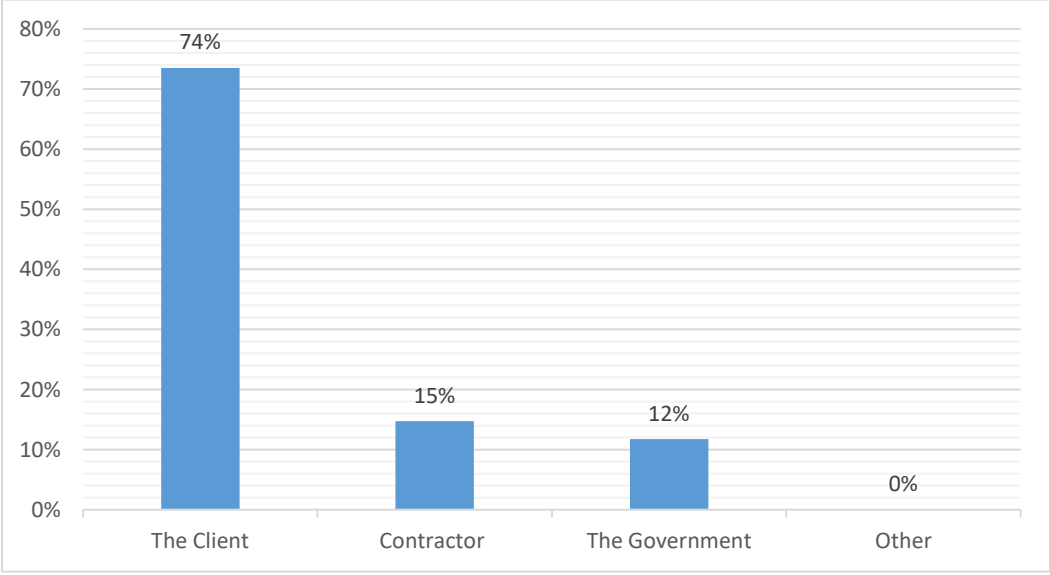


Figure 4.5: For Which of the following are you Representing in your capacity as PM

94% of the respondents admitted to being involved in projects that were behind schedule and were handed over after the contractual completion date. Project delay in this content was clarified as projects that exceeded the contracted construction period, where the delay was caused by avoidable factors. On average, 35% of the projects the respondents were involved in were delayed by an average of three months. This is like (Haseeb, et.al., 2011) findings on causes and effects of delays in large construction projects in Pakistan, where 80% of contraction projects were found to have faced delays. Only 20% of construction projects were completed within the scheduled time duration and within the estimated cost. It can be observed that irrespective of the geographic location, project delays seem to be a common problem in construction projects.

Respondents Average Project History	**Respondents**	**Average Delayed projects**	**Average Delay in months**
780 Projects	94%	35%	3 Months

Table 4.2: Project History

4.3. Establishment of the initial construction time period

This section of the questionnaire was set to address the research objective no. 1, through investigating how project managers or project planners determine the initial construction period. Open-ended questions were used to answer some of the questions.

The respondents have different opinions as to who determines the initial construction schedule, 43% of the respondents believed that the client determines the initial construction schedule, 38% says it's the consultant project manager, 14% says it's the contractor and only 5% says it's the other consultants, such as the Engineers, the Architect or the Quantity surveyor. It can be observed that based on the respondent's background in terms of experience and work history, the respondents have different opinions.

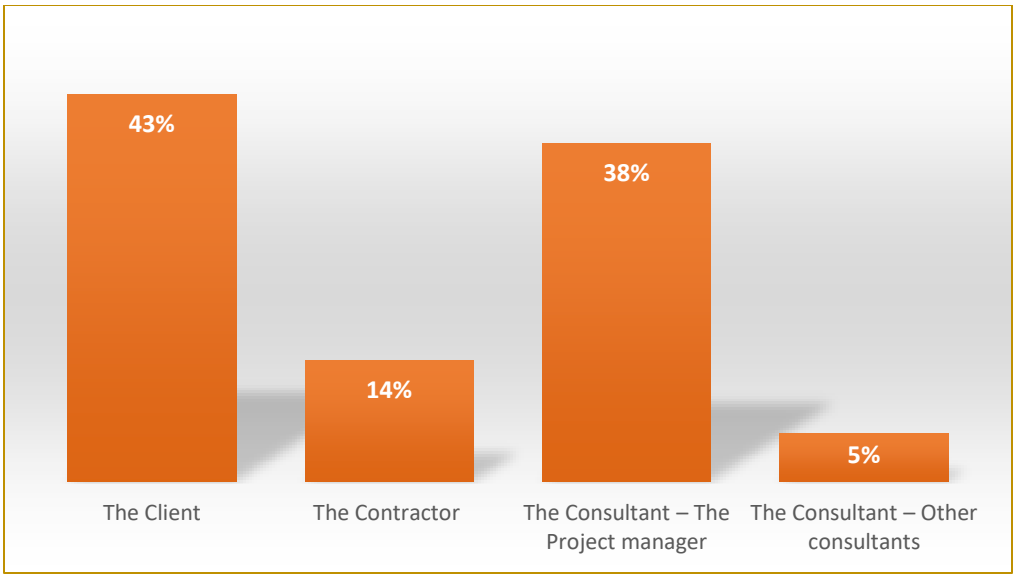


Figure 4.6: Who determines the initial construction schedule?

In Figure 7 below, 76% of the respondents reported that there are guidelines which are used to determine the construction schedule, these guidelines are mentioned in annexure 1 below. While 24% of the respondents are not familiar with any guidelines used in the construction industry to determine the construction schedule.

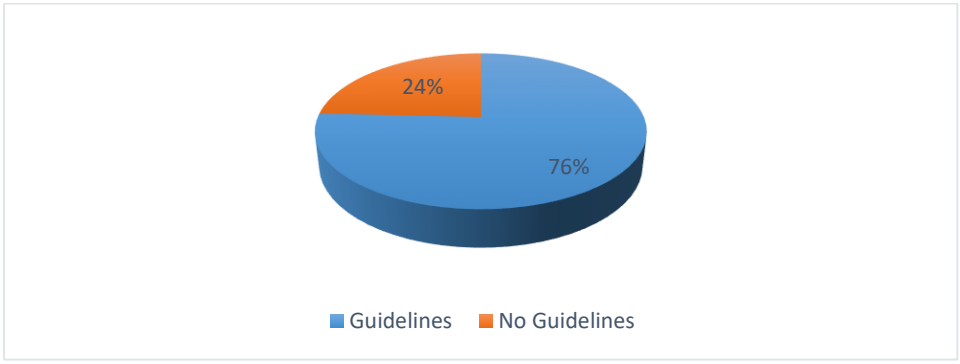


Figure 4.7: Guidelines used to determine Construction Schedule

Figure 8 below indicates that 55% of the respondents believe that the guidelines are effective, while 12% believe that the guidelines are ineffective. 24% of the respondents that do not use any guidelines did not respond on the effectiveness of the guidelines as this question was not relevant to them. While 9% are aware of the guidelines, however they did not respond on the effectiveness of these guidelines.

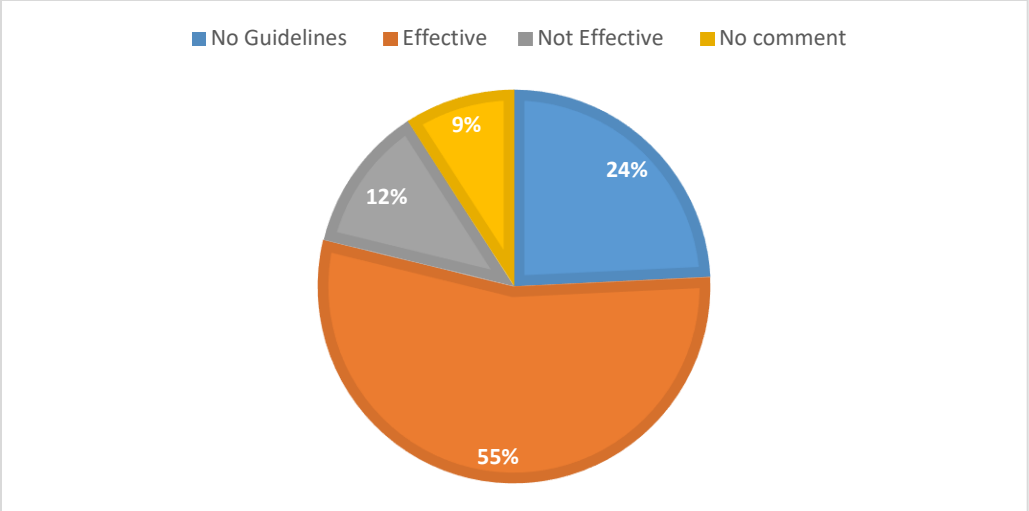


Figure 4.8: Effectiveness of the guidelines used to determine Construction Schedule

Once the respondents had specified the guidelines, the guidelines were categorized and summarized into 5 different categories. That is resources, Nature of the project, Client requirements, Experience and scope of works. Figure 10 below reveals that 38% of the respondents suggested that the scope of works is used in determining the construction programme. 24% reported that this is based on Historical data of similar projects, while 17% says that the duration is based on client's requirements. 17% reports that the duration is determined by the nature of the project, while only 3% reports that this is based on resources allocated. The respondent's opinions are listed in annexure 1 below.

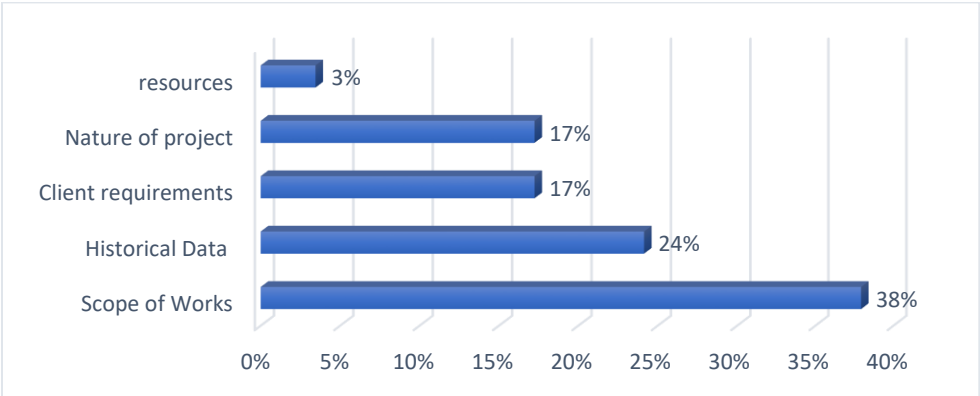


Figure 4.9: Guidelines to determine construction schedule

From the data collected, it can be observed that the respondents have different opinions in terms of who determines the initial construction programme. Though there is a reasonable response from respondents of different age groups and experience in the construction industry, it can be observed that the respondents have different opinions of the standards that are used in construction to determine the construction duration. This may be due to the construction industry not having a specific standard to determine the initial construction duration. The respondents identified the following, which they believe is used as guidelines to determine the construction schedule:

- The planning department derives a construction programme early in the project, which is then used to drive the documentation programme and the procurement programme.
- Time frames and output previously achieved by other contractors in previous jobs.
- The contractor specifies the duration by which he intends to complete the project.
- The scope of works and the urgency of the project.
- Constructability, complexity, Ground conditions, cash flow, labor intensive or machine based, design, drawings
- Submission of a Works Information (WI) to determine target price. - NEC 3 Guidelines
- Academic Years/Production Schedules and Stage of construction
- Best Practices
- Client requirements e.g. preferred date of occupation/use of the building - Effective or not depends on whether the client understands the nature of the project and what has informed their determined date of when they want to use the building.
- Resources, distance, and topography
- Nature of project
- Normal resource Inputs.
- constraints - Site, cash flow, recession
- Weather, Health and Safety and Complexity of the project.

- Precedent Schedules of how a similar project was executed elsewhere - not effective since every project is unique with unique challenges
- Programme logic and production output
- Time value of money
- Previous projects and contractor available - effective in cases where the client uses the same contractors in all their projects - relationships
- Period based on site of project in terms of GBA and number of floors

4.4. Causes of construction project delay

This section of the questionnaire seeks to investigate how the three industry participants, i.e. the contractor, the consultants and the client contribute to project delay due to unrealistic construction time periods. respondents were presented with tables that reflect common causes of schedule overruns that are client related, Contractor related and consultants related factors which were identified in academic literature published by accredited institutions.

4.4.1. Client Related Factors

Base on the Ranking (R), the calculated Mean ($\overline{X}$) and the Standard (σ) the following was observed, and is listed descending order, with the highest ranked cause first as listed in table 2 below: Design changes by the client during construction was ranked first by the respondents with a mean score of 4.27 and a σ of 0.876, Slow decision making process (R=2; $\overline{X}$=3.61; σ =1.116), Delays in approving drawings and materials (R=3; $\overline{X}$=3.44; σ =1.045) delays in progress payment (R=4; $\overline{X}$=3.39; σ =1.029), poor project co-ordination (R=5; $\overline{X}$=3.38; σ =0.942), Unrealistic project completion periods (R=6; $\overline{X}$=3.30; σ =1.159), Delays in Handing over the site (R=7; $\overline{X}$=3.29; σ =1.071) Poor communication by the client to the consulting and construction teem (R=8; $\overline{X}$=3.24; σ =1.247) and suspension of works by the owner (R=2; $\overline{X}$=3.61: σ =1.116).

These findings are similar to findings by (Odeyinka, *et al*, 1997) where client related causes of delay in Nigeria construction projects were found to be a variation of orders, slow decision making and problems in cash flow. Furthermore, (Haseeb, et al, 2011) also reported similar findings, where the most highly ranked and most important client related causes of delays in the Pakistan construction industry were finance and payments, slow decision-making, interference of client, change in specifications, unrealistic contract duration and requirements, and non-capable client's representative.

Table 4.3: Client Related Factors

	Rank (R)	Mean ($\overline{X}$)	Std. Deviation (σ)	Variance
Design changes by client during construction	1	4.27	.876	.767
Slow decision-making process	2	3.61	1.116	1.246
Delays in approving drawings and materials	3	3.44	1.045	1.093
Delay in Progress Payments	4	3.39	1.029	1.059
Poor project co-ordination	5	3.38	.942	.887
Unrealistic project completion periods	6	3.30	1.159	1.343
Delays in Handing over the site	7	3.29	1.071	1.146
Poor communication by the client to the consulting and construction team	8	3.24	1.032	1.064
Suspension of works by owner	9	2.84	1.247	1.555

4.4.2. Contractor Related Factors

Table 3 below reveals the respondents ranking of contractors related factors that causes schedule overruns in South Africa. Lack of relevant experience (R=1; $\overline{X}$=3.97; σ =0.861) rework due to construction errors (R=2; $\overline{X}$=3.72; σ =0.958), Poor communication or co-ordination (R=3; $\overline{X}$=3.61; σ =0.788) Delay in sub-contract work (R=4; $\overline{X}$=3.59; σ =0.798) Unrealistic construction programme (R=5; $\overline{X}$=3.42; σ =1.062) , conflicts in subcontractors schedule (R=6; $\overline{X}$=3.33; σ =0.990), conflict between contractor and other parties to the

project (R=7; $\overline{X}$=3.26; σ =1.154), difficulty in financing the project (R=8; $\overline{X}$=3.19; σ =1.330), delays in mobilization (R=9; $\overline{X}$=3.00; σ =1.191) construction methods (R=10; $\overline{X}$=2.94; σ =0.854). This is similar to findings by (Haseeb, et al, 2011) where the highly ranked contractor related causes of delay in the construction industry of Pakistan projects are inaccurate time estimation, old technology, and poor site management, delays caused by subcontractor, inaccurate cost estimation, and errors during construction.

Table 4.4: Contractor Related Factors

	Rank (R)	Mean ($\overline{X}$)	Std. Deviation (σ)	Variance
Lack of relevant experience	1	3.97	.152	.861
Rework due to construction errors	2	3.72	.169	.958
Poor communication or co-ordination	3	3.61	.137	.788
Delay in sub-contractor work	4	3.59	.141	.798
Un-realistic construction programme	5	3.42	.185	1.062
Conflicts in subcontractor's schedule	6	3.33	.172	.990
Conflicts between contractor and other parties to the project	7	3.26	.207	1.154
Difficulties in Financing project	8	3.19	.235	1.330
Delays in site mobilization	9	3.00	.211	1.191
Construction methods	10	2.94	.153	.854

4.4.3. Consultants Related Factors

Table 3 below reveals the respondents ranking of consultants related factors that cause schedule overruns in South Africa. Delays in producing design documents (R=1; $\overline{X}$=4.00; σ =0.791) Mistakes and inconsistences in the design (R=2; $\overline{X}$=3.75; σ =0.762) unclear and inadequate details in drawings (R=3; $\overline{X}$=3.75; σ =0.880) Delay in approving major changes in the scope of work (R=4; $\overline{X}$=3.73; σ =0.839) Inadequate experience of consultants (R=5; $\overline{X}$=3.55; σ =1.034) lack of relevant construction experience (R=6; $\overline{X}$=3.52; σ =1.202) Poor communication and co-ordination (R=7; $\overline{X}$=3.45; σ =0.869) un-

realistic determination of construction programme (R=8; $\overline{X}$=3.38; σ =1.185) Lack of advanced engineering design software (R=9; $\overline{X}$=2.61; σ =1.145). According to (Haseeb, et al, 2011), in the study of causes of delays in the construction industry in Pakistan, similar finding to this study were recorded, where the most important and highly ranked causes of delay by the consultant are changes in drawings, inadequate consultant experience, preparation and approval of drawings, inaccurate site investigation, contract management, and slow response and inspection.

Table 4.5: Consultants Related Factors

	Rank (R)	Mean ($\overline{X}$)	Std. Deviation (σ)	Variance
Delays in producing design documents	1	4.00	.791	.625
Mistakes and inconsistences in the design	2	3.75	.762	.581
Unclear and inadequate details in drawings	3	3.75	.880	.774
Delay in approving major changes in the scope of work	4	3.73	.839	.705
Inadequate experience of consultants	5	3.55	1.034	1.068
Lack of relevant construction experience	6	3.52	1.202	1.445
Poor communication and co-ordination	7	3.45	.869	.756
Unrealistic determination of construction programme	8	3.38	1.185	1.403
Lack of advanced engineering design software	9	2.61	1.145	1.312

4.4.4. Other Factors that Causes construction project delays

Over and above the factors that were listed in the questionnaire, the respondents identified other factors that affect construction project delivery in south Africa, and are as follows:

- Political driven factor (such as labor Unrest Industrial action and sympathy action).
- Unforeseen weather conditions.
- Poor contract management.
- Government Procedure.

- Client related procurement delays
- Terrain related issues.
- Site Location.
- Time between tender and construction should be kept short to reduce cost implications.
- Price escalation and interest rate.
- Student strike.
- Architects designs that became costly and unpractical to user.
- Tender process not clear when appointing subcontractors.
- Budget overruns.
- Lack of co-ordination between different expertise.
- JV or Partnership conflicts during construction.
- Poor leadership of Project lead or Principal Agent.
- Late end user requirements.
- Late cost approvals on variation orders.
- Appointment of contractor to start work on the client.
- Changes of scope of works (by Client and consultants).
- Changing senior management on site (contractor).
- Client's unrealistic expectations.
- Lack of contingency – expect more for less, Increasing building costs.
- Lack of experience and trained Artisans.
- Diversity in the markets.
- Poor planning and coordination of sub-contractors.
- Late order of materials.
- Late issuing of information for long lead time items.
- Pressure to commence early.
- Disregard for H&S and Practical baseline construction programme.

Through literature and data collected from respondents, the research problem has been proven correct. The construction industry in south Africa experience a lot of project

delays, however, the delays are due to various factors. Research has identified many factors that causes delays in construction projects. (Assaf, *et al,* 2006) in their research to identify causes of delays in construction, categorized the factors that causes delays into 9 groups, that is delays caused by owner, contractor, materials, Design, equipment, project, labour, environmental or external and consultants. It was found that the most frequent causes of delays are those that are caused by owner, contractor and consultants. For the purpose of the research, the research questionnaires have addressed only factors related to the owner, the contractor and the consultant. (Haseeb, et al, 2011) identified the following causes of delays in the construction industry in Pakistan: financial related factors, material related factors, labour related factors, equipment related factors, contract related factors as well as external related factors:

- The most highly ranked financial factors are delays in payments to suppliers and subcontractors, inadequate fund allocation, client's financial problems, inflation and monthly payment problems.
- Material related factors are quality of material, shortage of material, the supply of material, late delivery, the rise in material prices, and inadequate material.
- Labour related factors are: labour productivity, shortage of skilled labour, slow working of labour, labour strikes, non-attendance, and labour injuries.
- Equipment related factors are: improper equipment, allocation problems, and inadequate quantity of equipment, equipment failure, improper old equipment, and shortage of equipment parts.
- Contract related factors are: change orders, contract modifications, incomplete documents, major disputes and negotiations, mistakes in contract document, and improper organizational structure.
- External factors are natural disasters, unforeseen site conditions, organizational changes, regulatory changes, the problem with neighbors, and conflicts.

The respondents further reported the following factors that may cause construction delays:

- Failure to manage the end-user or the client expectations of the completed project - If the client knows what he wants and the consultant knows how to interpret the client, given the contractor can turn it into reality in time delays would be minimal
- Different expertise in the construction industry contributes differently to project delays, depending on their area of expertise, however, majority of construction delays are caused by the client- because of changes in the initial design. The contractor - poor planning as well as poor management of subcontractors.
- The Procurement processes are too cumbersome impacting heavily on construction or even on the entire project programme.
- Politics - If politicians can leave construction industry for the relevant people with experience, then there would be limited delays in construction projects. Also, the GCC 2010 contract supports the contractor, and is not favorable to the client. Imposing of penalty should be introduced on the GCC contract, more especially in the Gauteng Province. Gauteng is even worse compare to other provinces. Very important CIPRO and CIBD need to register people for the business based on experience and knowledge.

4.5. Conclusion

Through research we have determined that project delay in the construction industry is a reality and it affects the world at large. The research analysis has revealed that similar problems that the rest of the world faces pertaining to construction projects affect the South African construction industry. Though the sample was only limited to Gauteng proving, the same can be assumed for projects in other provinces and hence, South Africa at large.

All the respondents have experienced projects delays to over 94% of the projects, on average, the delay was more than 3 months. The respondents agreed that the construction duration is determined by the client or the consultants, depending on the nature of the project and the structure of the professional team appointed. No literature was found on guidelines published by an accredited body. Though respondents are familiar with guidelines used to determine the construction duration, these guidelines are not documents, and not available to all in the construction industry.

CHAPTER 5: SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

5.1. Introduction

This chapter presents the summary of findings, the conclusion as well as recommendations of the study. The study has addressed the causes of construction projects delays in south Africa due to unrealistic construction programmes. Literature was used in chapter two of the research to uncover knowledge and ideas from past research, that address the research topic. The methodology that was adopted when collecting data was described in detail in chapter 3. Chapter four presented the data analysis and discussion of results on the data collected from respondents. In this chapter, findings of the research are summarized and conclusions and recommendations are drawn based on the research findings.

5.2. Summary of findings

This study was designed to address three (3) specific objectives, through addressing the objectives, the researcher could answer the research question posed. The three objectives are listed below:

1. Investigate how project managers or project planner determine the initial construction time periods.
2. Investigate how the three industry participants i.e. the contractor, the consultants, and the client contribute to project delay due to unrealistic construction time periods.
3. Investigate what can be done to assist inexperienced consultants in determining construction time periods.

5.2.1. Investigate how project managers or project planner determine the initial construction time periods.

It is evident that the respondents have different opinions in terms of who determines the initial construction programme. Though there is a reasonable response from respondents of different age groups and experience in the construction industry, it can be observed that the respondents have different opinions of the standards that are used in construction to determine the construction duration. This may be due to the construction industry not having a specific standard to determine the initial construction duration. The Federal Transit Administration (FTA) in the project management handbook, that provides guidelines to public transit agencies undertaking construction projects provide dates for the beginning of a project and the end date through the Agency's Capital Improvement Plan (CIP). The Agency develops the project schedule from a well-defined scope of works. The project schedule determines the time it will take to complete a project, and is developed through breaking down work into activities which are required to accomplish the scope of each deliverable.

Australia, Malaysia, The UK and Hong Kong, developed statistical models for predicting the duration of a construction project. These models were based on the project scope factors as primary variables. The models determined the construction duration by taking into consideration the construction cost, gross floor area, the size of the building or the project complexity level, as well as management attributes, such as the effectiveness of communication of decision-making among contracting parties (Walker, *et al*, 2000; Walker 1994).

From data collected, 76% of the respondents reported that there are construction guidelines that are used to determine the construction programme. The guidelines as specified by the respondents were categorized into 5, that is resources, Nature of the project, Client requirements, Experience and scope of works. 38% of the respondents suggested that the scope of works is used to determine the contraction programme. This is similar to findings from (Federal Transit Administration, 2007) where they stated that programme of works is developed from the initial client brief. The brief specifies the scope

of works, whereby the client defines the objectives to be accomplished for the final product. The scope of works is developed by the client before the project manager or the design consultants are involved in the project. The scope is developed with the help of the project manager and/or the design consultants. The consultants develop the scope based on experience on similar projects. The brief forms the basis of the project and hence every activity that follows throughout the lifecycle of the project. The programme of works is developed from the initial brief.

5.2.2. Investigate how the three industry participants i.e. the contractor, the consultants, and the client contribute to project delay due to unrealistic construction time periods.

Through literature, it was determined that the project scope is determined by the project team during the analysis stages of a project, whereby the outcome of the analysis by the project team determines the overall development process output (Dvir et al., unpublished paper, 2002). (The procurement guideline for consulting engineers, 2011) reports that the project manager or the client representative assist the client in establishing client requirements and preferences, assessing user needs and options, appointment of necessary consultants, establish the project brief including project objectives, priorities, constraints, assumptions aspirations and strategies during the first the inception stages.

The origination and initiation phase is where major decisions such as deciding the project's objectives and planning the project execution are made. These decisions have the most influence on project performance, and the overall project success (Dvir, *et al,* 1999). (Assaf, *et al*, 2006) in their study identified inadequate planning and scheduling of projects by contractors as one of the most important causes of delay. In South Africa, construction time predictions in construction projects are derived from the client's brief or derived by the construction planner, who uses available project data.

Based on data obtained from the respondents, Unrealistic project completion periods was ranked at number 6, with a mean score of 3.30, on client related causes of delay. For

contractor related causes of delay, Unrealistic construction programmes are ranked fifth, with a mean score of 3.42. The respondents ranked unrealistic determination of construction programmes at eighth place, out of nine data point under consultants related issues. From literature, we can conclude that the consultant project manager is more responsible for determining the construction duration as they are involved from the initial stage, as client advisors. However, the respondents had a different opinion from that obtained through literature, as they believe that unrealistic construction programme has little effect on the overall project delay.

From numerical data obtained from the respondents, 43% believes that the client determines the construction duration, while 38% says it's the consultant project manager and only 14% says it's the contractor. The client, through the client's representative determines the construction programme. This client representative in most cases is the project manager, employed by the client. The project manager is informed by the scope of works or the client's requirements when estimating the construction duration.

5.2.3. Investigate what can be done to assist inexperienced consultants in determining construction time periods.

From literature, it was realized that the experience and qualifications of the industry personnel do not only affect the duration, however, this has a strong effect on the quality performance of a project. (Enshassi, et.al. 2009) stated that when the project is not performing in accordance with the scheduled period the project is said to have been delayed, this is affected by time performance. (Belassi, *et al,* 1996) reported that a project manager is a key stakeholder in a construction project, as the manager's competence affects the project planning, scheduling and communication. The project manager's performance in a project is affected by the individuals kills, commitment, experience, authority and characteristics, and may affect the overall project success.

As per the data obtained from the respondents, the contractor's experience is vital when considering the successful delivery of a project. The respondents ranked lack of relevant

contractor’s experience highly in the research, with a mean score of 3.97. The consultant's experience, on the other hand, had a ranking of 5, and a mean of 3.55. However, lack of relevant construction experience was found not to have much effect with a ranking of 6 and a mean of 3.52. Though an inexperienced contractor is most likely to cause project delay, other respondents believe that it is highly unlikely that contractors would cause most of these delays except for communication related issues. Communication is usually a problem where the contractor fails to communicate with the project team on time. The respondent further noted that there are contracts in place to avoid most of the issues indicated in this section. Also, it is the client’s responsibility to check and approve the contractor's schedule, the construction methods, etc. Lack of relevant experience by the contractor is largely related to poor selection of a contractor by the client.

Poor selection of a contractor is largely related to the lack of experience by the consultant or the project manager to be specific and the client. Historical data obtained from the literature, has proven this statement true. The project manager gives a recommendation to the client to appoint a suitable contractor on the job. This is informed by the tender adjudication that takes place. During the tender adjudication, the project manager, together with other consultants would review the submitted documents submitted by the bidder, and advise the client. An experienced project manager would consider all risks involved in appointing a contractor for a construction project. To assist inexperienced consultants, there should be guidelines that are carefully adhered to and enforced within the construction industry to ensure compliance. Though for certain jobs, the contract document specifies the level of experience required from the consultants, this should be carefully monitored to ensure that the listed individuals are responsible and involved in decision making.

5.2.4. How does the initial construction programme impact the eventual completion time of the project?

Previous research has revealed that in cases where the project was delayed and took longer than stipulated to complete, severe criticism of the construction industry would arise. Completion of projects on time is an indication of an efficient construction industry and is regarded the most important criterion of project success. Quality management during construction directly affects completion time, through inadequate supervision levels, ineffective coordination of resources and activity sequencing (Aiyetan, *et al,* 2012). Delays in the construction industry are unavoidable, however, they can be limited.

Risk and uncertainty are unavoidable in all construction activities and hence the schedule of works also contains significant uncertainty. Schedule delays are therefore common in construction projects worldwide and result in considerable losses to project stakeholders. (Luu, Kim, *et al,* 2009). Through literature and data collected, it was revealed that even though the construction programme has an impact on project delivery, there are other factors that affect the overall project delivery.

The construction programme was found not to be a major cause of the delay; the programme may affect other activities that will eventually result in project delay. The three highly ranked causes of delays by the client, that is design changes by the client during construction, slow decision-making process and delays in approving drawings and materials can be incorporated in the initial construction programme if these are initially identified as risks. The same applies to the top three highly ranked causes of delays by the contractor, that is, lack of relevant experience, rework due to construction errors as well as poor communication and co-ordination.

The construction programme impact a project where un-realistic dates are provided on the initial programme by the project manager. The project manager prepares a baseline programme to the client, indicating the estimated duration to complete the project. These baseline dates are intern used by contractors to programme their works. Where the baseline dates are not realistic, the contractors critical path will be affected. Where the

activities on the critical part are affected, there is due to be a delay, unless the contractor mitigates the delay on time. The effect on the critical path may be due to other factors, hence the link between a programme and the course of delay is not clear.

5.3. Recommendations

In view of the findings of this research, the following recommendations are therefore prescribed for concerned bodies:

1. The construction industry participants must work together to ensure that the projects are completed within the stipulated time and on budget. As these industry participants affect project completion differently. Standards and systems must be put in place to address the industry participants accordingly.
    - The client must ensure that the scope is approved by all relevant parties within the client's organization to avoid late changes to the initial brief.
    - The contractor must employ capable individuals with relevant experience when working on a project.
    - The design consultants must allocate enough time for the design development, to ensure that the designs are completed before they go on tender, this will minimize variations.
2. The industry participants must train inexperienced employees to improve their skills to ensure effective delivery of projects.
3. The client, when developing the scope of works must involve a project manager, with the relevant skills and expertise to assist. There must be a comprehensive risk assessment of the project as per the scope of works, to identify possible problems that may result in delays. These identified risks must be incorporated in the programme.
4. The Construction Industry Development Board (CIDB) must have a criterion to register construction companies, to ensure that the registered parties have the relevant skills to deliver projects on time and within budget.

5.4. Suggestions for further research

There are numerous research avenues in the future as a result of this study. The following are therefore recommended for future research:

1. Investigate how the scope of works and the magnitude of the project affects the delivery of a project.
2. Explore actions that can be taken to limit construction project delays in South Africa.
3. Investigate how the CIDB can impose restrictions for construction company registration and how these limits will affect the economy.
4. Investigate how the construction industry can develop standards to develop the initial construction programme.

REFFERENCES

Abdul-Rahman, H. and Berawi, M. 2006, Delay mitigation in the Malaysian construction industry, Journal of Construction Engineering Management, 132(2), 125–133.

Aibinu, A.A. and Jagboro, G.O. 2002. The effects of construction delays on project delivery in Nigerian construction industry; Faculty of Environmental Design and Management.

Aiyetan, A.O., Smallwood, J.J. and Shakantu, W., 2012. A linear regression modeling of the relationship between initial estimated and final achieved construction time in South Africa Mandela Metropolitan University, Nelson Mandela Metropolitan University, Port Elizabeth, 41 – 53.

Ali, A.S. and Kamaruzzaman, S.N. 2010. Cost performance for building construction projects in Klang Valley. Journal of building performance, Volume 1: 2180-2106.

Al-Najjar, J.M. 2002. Factors influencing time and cost overruns on construction projects in the Gaza Strip. Master's Thesis: The Islamic University of Gaza

Amhel, O., Soyingbe, A. and Odusami, K. 2010. Significant factors causing cost overruns in telecommunication projects in Nigeria. Journal of Construction in Developing Countries, 15(2), 49-67.

Andersen, E.S. 1996. Warning: activity planning is hazardous to your project's health, International Journal of Project Management: 89–94.

Assaf, S.A. and Al-Hejji, S. 2006, Causes of delay in large construction projects. International Journal of Project Management, 349 – 357.

Atkinson, R. 1999. Project management: cost, time and quality, two best guesses and a phenomenon, it's time to accept other success criteria International Journal of Project Management Vol. 17, 337-342.

Babbie, E. R. (1990). Survey research methods. Belmont, Califonia: Wadsworth.

Baloyi, L. and Bekker, M. 2011. Causes of construction cost and time overruns: The 2010 FIFA World Cup stadia in South Africa. University of Pretoria, Peer reviewed: 55 -67.

Belassi, W. and Tukel, O.I. 1996. A new framework for determining critical success or failure factors in projects. International journal of Project management, 141-151.

Bell, J. 2005, Doing your Research Project: A guide for first-time researchers in education, health, and social science 4th Edition. England

Berman-Brown, R., & Saunders, M. N. K. (2008). Dealing with Statistics: What you need to know. Maidenhead, England: Open University

Bryman, A.E. & Burgess R.G. 1999. *Qualitative Research. V*olume 4, London: Sage.

Burns, N., and Grooves, K.G. 1993. The Practice of nursing research conduct, critique, and utilization. Second Edition, Philadelphia: WB Saunders company.

Campbell, D. T., and Stanley, J. C. 1963. Experimental and quasi-experimental designs for research. Chicago: Rand McNally

Chan, A. and Chan, D. 2003. Developing a benchmark model for project construction time performance in Hong Kong. Hong Kong Polytechnic University, Building, and Environment, 339 – 349.

Chan, A.P.C., Scott, D and Chan, A.P.L. 2004, Factors Affecting the Success of a Construction Project. International journal of Project management.

Chan, D.W.M, and Kumaraswamy, M.M. 1997. A comparative study of causes of time overruns in Hong Kong construction projects, The University of Hong Kong, Hong Kong, International Journal of Project Management, 55-63.

Cheung, S.O., Suen, H.C.H. and Cheung, K.K.W. 2004. PPMS: a Web-based construction project performance monitoring system, Automation in Construction 13: 361–376.

Construction Engineers South Africa, 2011. Procurement Guideline for Consulting Engineering Service. CESA

Creswell, J. W. (2003). Qualitative, quantitative, and mixed methods approach 2nd edition. Thousand Oaks, CA: Sage

Creswell, J.W. 2013. Research Design Qualitative, Quantitative and Mixed Methods Approaches. Second edition, University of Nebraska, Lincoln.

Din, S., Abd-Hamid, Z. and Bryde, D.J. 2010. ISO 9000 certification and construction project performance: The Malaysian experience, International journal of project managers, Malaysia, 1044-1056.

Dvir, D., Lipovetsky, S., Shenhar, A. and Tishler, A. 1999, Common managerial factors affecting project success, Working paper, Tel Aviv University, School of Management.

Dvir, D., Raz, T. and Shenhar, A.J. 2003. An empirical analysis of the relationship between project planning and project success. The international journal of project management, 89-95.

Enshassi, A., Mohamed, M. and Abushaban, S. 2009, Factors affecting the performance of construction projects in the Gaza Strip, Journal of Civil Engineering and Management, Islamic University of Gaza, 269-280

Fallahnejad, M.H. 2013. Delay causes in Iran gas pipeline projects. International Journal of Project Management, 136–146.

Faridi, A.S, and El-Sayegh, S.M. 2006. Significant factors causing a delay in the UAE construction industry. Construction Management and Economics, 1167-76.

Forsberg, K., Mooz, H. and Cotterman, H. 2000. A Model for Business and Technical Success, John Wiley & Sons Inc., N.Y., US.

Frimpong, Y., Oluwoye, J. and Crawford L. 2003. Causes of delay and cost overruns in the construction of groundwater projects in developing countries; Ghana as a case study. International Journal of Project Management: 321–326.

Gündüz, M., Nielsen, Y., and Özdemir, M. 2013, Quantification of delay factors using the relative importance index method for construction projects in Turkey, Journal of Management in Engineering, 29(2), 133–139.

Heerkens, G.R. 2002. Project Management. McGraw-Hill, N.Y., US.

Haseeb, Xinhai-Lu, Bibi, Maloof-ud-Dyian, Rabban, 2011, Causes and effects of delays in Large construction projects of Pakistan, Karachi, Pakistan. Arabian Journal of Business and Management Review Vol. 1, No.4;

Islam, M.S. Trigunarsyah, B., Hassanain, M. and Assaf, S. 2015, Causes of Delay in Construction Projects in Bangladesh. The International Conference on Construction Engineering Project Management, October, Korea.

Jergeas, G. 2008. Analysis of the front-end loading of Alberta mega oil sands projects. International Project management journal; 95–104.

Kazaz, A. and Birgonul, M.T. 2005. The evidence of poor quality in high rise and medium rise housing units: a case study of mass housing projects in Turkey. Build. Environment, 1548–1556.

Kothari, C.R. 2004. Research Methodology: Methods and Techniques. Revision 2. New Age International Publishers

Kruger, L.P. 2011, The impact of black economic empowerment (BEE) on South African businesses: Focusing on ten dimensions of business performance, Project and Quality Management, University of South Africa.

Luu, V., Kim, S., Van Tuan, N. and Ogunlana, S.O. 2009. Quantifying schedule risk in construction projects using Bayesian belief networks. International Journal of Project Management: 39–50

Memon, A.H., Rahman, I.A. And Azis A.A.A. 2011. Preliminary Study on causative factors leading to Construction cost overrun. International Journal of sustainable construction engineering and technology, Volume 2.

Memon, A.H., Rahman, I.A., Asni, A. and Azis, A. 2010, Factors Affecting Construction cost in Mara Large Construction Project: Perspective of Project Management Consultant. International Journal of Sustainable Construction Engineering and Technology, Vol 1, No 2, December 2010.

Michalak, C.F. 1997. The cost of chasing unrealistic project schedules. Transactions

Miles, M.B., and Huberman, A.M. 1994. Qualitative Data Analysis, 2nd edition. Thousand Oaks, CA: Sage Publications.

Mohamad, M.R.B. 2010. The Factors and effect of delay in government construction project, Case study in Kuantan, Bachelor's degree thesis: University of Malaysia Pahang.

Motaleb, O. and Kishk, M. 2010, An Investigation into Causes and Effects of Construction Delays in UAE, The Scott Sutherland School of Architecture and Built Environment, Robert Gordon University.

Myers, M. D. 2009. 'Qualitative Research in Business & Management'. Sage, London

Nepal, M.P., Park, M. and Son, B. 2006. Effects of Schedule Pressure on Construction Performance. The Project management journal; 132 – 182.

Newman, I. and Benz, C.R. 1998. Qualitative – Quantitative Research Methodology: Exploring the interactive Continuum. Southern Illinois University, United States of America.

Nxesi T.W. 2014, Department of public works: the Republic of South Africa, Annual report.

Ogunsemi, D.R., and Jagboro, G.O. 2006. Time-cost model for building projects in Nigeria. Construction Management and Economics, 253-258.

Olawele, Y.A., And Sun, M. 2010. Cost and time control of construction projects: Inhibiting factors and mitigating measures in practice. Construction Management and Economics: 509 – 526.

Pheng, L.S. and Chuan, Q. T. 2006. Environmental factors and work performance of project managers in the construction industry, International Journal of Project Management.

Phillips, D. C., and Burbules, N. C. 2000. Postpositivism and educational research. New York: Rowman and Littlefield.

Polit, D. and Hungler, B.P. 1993. Essentials of nursing research. Methods, appraisal, and utilization. Third edition. Philadelphia: Lippincott.

Project Management Institute PMI, viewed 17 April 2015 http://www.pmi.org.

Rafig, M.C. Abdur, R.N., and Hamza, F.G. 2012. Cost and time overruns in highway projects in Pakistan. Centenary Celebration: 1912-2012.

Robson, C. 2002. Real World Research. A Resource for Social Scientists and Practitioner Researches, 2nd edition. Blackwell: Oxford

Saunders, M. and Paul, T. 2013. The Layers of Research Design. Report

Saunders, M., Lewis, P., and Thornhill, A. 2009. Research methods for business students, fifth edition. Pearson Education Limited: England

Schlickman, J.S. 2003. ISO 9000:2000 Quality Management System Design. Artech house, Boston, US.

Semple, C., Hartman, F.T. and Jergeas, G. 1994, Construction claims and disputes: Causes and cost/time overruns. Journal of Construction Engineering and Management, 120(4), 785-795.

Serpell, A. 1999. Integrated quality systems in construction projects: the Chilean case. International journal of project managers: 317–322.

Shenhar, A.J.,Dvir, D., Levy, O. and Maltz, A.C. 2001. Project Success: A Multidimensional Strategic Concept, Long Range Planning, 699–725

Silverman, D. 2000. Doing Qualitative Research: A Practical Handbook. London: Sage.

Statistics South Africa, Quarterly Financial Statistics, 2015, viewed 07 April 2016 from http://www.statssa.gov.za/?p=6000.

Stuart H. Sobel (March 1996). Arbitration in the construction. Viewed 10 April 2016 from http://www.srhl-law.com/files/sobe12.pdf.

Sunjka, B.P., and Jacob, U. 2013. Significant causes and effects of project delays in the Niger delta region, Nigeria. SAIIE25 Proceedings: Stellenbocsh, South Africa.

Takim, R. and Akintoye, A. 2002. Performance indicators for successful construction project performance. University of Northumbria, Vol. 2, 545-55.

The Construction Industry Development Board (CIDB) 2015, Standard For Uniformity in Construction Procurement

The Construction Industry Indicators (CIDB) 2015, Annual Report

The Construction Industry Indicators (CIDB) 2015, Summary Results

Unani, E.C., Okprocha, K.A. and Emeribe, S.C. 2013. Analysis of factors influencing time and cost overruns on construction projects in South Eastern Nigeria. International Journal of Management Sciences and Business Research, Volume 2: 2226-8235

Walker, D.H.T. 1994. An investigation into factors that determine building construction time performance. Ph.D. thesis, Royal Melbourne Institute of Technology, Australia, 1994.

Walker, D.H.T., and Vines, M.W. 2000. Australian multi-unit residential project construction time performance factors. Engineering, Construction and Architectural Management: 278–84.

Wortham, G. 2005. Construction Delays and Best Practices, Idaho Transportation Department

Zhu, K. and Lin, L. 2004. A stage by stage factor control framework for cost estimation of construction projects, owners driving innovation. International Conference. HTTP:/flybjerg.plan.aau.dk/JAPAASPUBLISH

Annexure 1: Guidelines to determine construction schedule

Guidelines	Category
The planning department derives a construction programme early in the project, which is then used to drive the documentation programme and the procurement programme.	Scope of Works
Time frames and output previously achieved by other contractors in previous jobs.	Historical Data
Historical information, for similar projects	Historical Data
The contractor specifies the duration by which he intends to complete the project.	Scope of Works
The scope of works and the urgency of the project.	Scope of Works
Constructability, complexity, Ground conditions, cash flow	Scope of works
Submission of WI to determine target price. - NEC 3 Guidelines	Scope of works
Completed projects - Not effective as different areas have different set of problems	Historical Data
Academic Years/Production Schedules and Stage of construction	Scope of works
Best Practices	Historical Data
Client requirements e.g. preferred date of occupation/use of the building - Effective or not depends on whether the client understands the nature of the project and also what has informed their determined date of when they want to use the building.	Client requirements
Resources, Distance, and topography	Nature of project
Nature of project	Nature of project
The client specifies how long, what the budget is, how many /much resources are available and penalties for delays. Most of the client's initial decisions are not well informed, thereby leading to a lot of changes while the project is ongoing.	Client requirements
Normal resource Inputs.	Resources
constraints - Site, cash flow, recession	Nature of project

Weather, Health and Safety and Complexity of the project.	Scope of works + Nature of the project
Precedent Schedules of how a similar project was executed elsewhere - not effective since every project is unique with unique challenges	Historical Data
Programme logic and production output	Nature of project
Depends on the company's priorities and how soon they want the final facility, product or outcome. This can be a bit unfair to the contractor	Client requirements
Time value of money	Client requirements
Complexity, scope, labor intensive or machine based, design, drawings	Scope of Works
Historic data on duration for similar projects	Historical Data
Complexity, scope, labor intensive or machine based, design, drawings	Scope of Works
construction schedule	Scope of works
Previous projects and contractor available - effective in cases where the client uses the same contractors in all their projects - relationships	Historical Data
Period based on site of project in terms of GBA and number of floors	Scope of works

Annexure 2: Research Programme

Item	Period	Target date	Completion details
Research Design & Methods	4 weeks	01/05/2016 to 30/05/16	Completed
Research Proposal Submission	3 weeks	01/06/2016 to 20/06/16	Completed
Oral Presentations	1 days	23/06/2016	Completed
Revision and Final research proposal submission	2 weeks	25/06/2016 to 4/07/2016	Completed
Gaining approval	1 day	8/07/2016	Completed
Ethics submission and approval	4 Weeks	01/07/2016 to 31/07/2016	Completed
Fieldwork / Data collection	6 weeks	1/09/2016 to 08/10/2016	Completed
Data analysis, Conclusions, and Recommendations	4 weeks	09/10/2016 to 05/11/2016	Completed
Report Preparation, Reviews by Supervisor and Revisions	4 weeks	06/11/2016 to 03/12/2016	Completed
Submission of the final dissertation	1 week	04/12/2016 to 12/12/2016	Completed

Annexure 3: Consent Letter

University of the Witwatersrand
School of Construction Economics and Management

TO WHOM IT MAY CONCERN

Dear Sir/Madam:

LETTER OF INVITATION TO PARTICIPATE IN A RESEARCH SURVEY

This research is conducted in fulfillment of the requirements for the BUQS7009 course in the School of Construction Economics and Management at Wits University, South Africa. The research topic is **"The influence of unrealistic initial contract duration on Time performance of construction projects in South Africa"**. The study is a pre-requisite of the department for the completion of an MSC in Project Management in Building course.

The aim of the research is to determine the impact or unrealistic initial construction programmes on time

We guarantee that the privacy, confidentiality, dignity, rights and anonymity of the respondents will be respected at all times, and strict ethical guidelines will be adhered to. The information provided by the respondents will only be used for academic purposes. Participants are not forced to participate in the study or to answer all questions, Participation is voluntary.

The questions will take 15 minutes to complete
Please answer the questions truthfully and sincerely

Your response will be highly appreciated
Sincerely
Amanda Viola Mavasa
Student

Annexure 4: Information Document

University of the Witwatersrand, Johannesburg

School of Construction Economics & Management

Private Bag 20, Wits 2050, South Africa

Dear sir/madam

Participant Information Sheet:

Study title: The influence of unrealistic initial contract duration of time performance of construction projects in South Africa

My name is Amanda Viola Mavasa, MSc student at the University of the Witwatersrand.

I, the researcher, request your participation in the form of answering the relevant questions, set out in a written questionnaire.

Research Study Information

Background of this study: The construction industry in many countries is faced with challenges when it comes to construction project delivery. Projects are delayed due to many factors, however, planning is found as one of the most important factors affecting delay. The study will focus on delays caused by the initial project time period, which is determined by the project manager, used by the contractor as a base to schedule the project.

The aim of the study: to determine the impact or unrealistic initial construction programmes on time.

The Objectives:

1. Investigate how project managers or project planner determine the initial construction time periods.
2. Investigate how the three industry participants i.e. the contractor, the consultants and the client contribute to project delay due to unrealistic construction time periods.

3. Investigate what can be done to assist inexperienced consultants in determining construction time periods.

To achieve objective results, the survey is geared towards Project Management practitioners who are registered as professionals with the ACPM. with relevant knowledge and experience in the Built Environment in South Africa. Participation is voluntary. The survey will run until the 08th of October 2016. The survey questionnaires will be mailed to potential respondents. The expected duration to complete the survey should be no more than 15 minutes.

The participants will not be exposed to any kind of risk. Efforts will be made to keep personal information confidential.

Organizations that may inspect and/or copy your research records for quality assurance and data analysis include the Research Ethics Committee.

If you have any pertinent questions and require further information, please contact me on 076 518 0487 or amandaviola.mavasa@gmail.com, or my supervisor (Dr. Stephen Allen) at 011 717 7658 or Stephen.Allen@wits.ac.za.

Amanda Viola Mavasa

MSc Project Management in Construction Candidate

Annexure 5: Research Instrument

QUESTIONNAIRE

Title: The influence of unrealistic initial contract duration on Time performance of construction projects in South Africa

Instructions: Please answer the following questions by crossing the relevant block or writing down the response in the space provided.

Section A – Background Information

This section of the question refers to the background or biographical information. The researcher is aware of the sensitivity of the questions, however, the information will allow us to accurately compare groups of respondents.

1. Gender:

Male		Female	

2. Age Group

Between 20 years and 30 years	
Between 31 years and 35 years	
Between 36 years and 40 years	
Between 41 years and 45 years	
Between 46 years and 50 years	
Between 51 years and 55 years	
56 years and above	

3. Professional Qualification Obtained (background)

Architect	
Quantity Surveyor	
Engineering	
Project Manager	

Construction Manager	
Other: Please specify ……...	

4. Highest qualification obtained

No Qualification / On the Job Training	
Matric Certificate (Grade 12)	
Diploma	
Bachelor's Degree	
Master's Degree	
Doctorate	
Other: Please specify ……...	

5. Years of Experience in the construction Industry

Between 1 years and 5 years	
Between 6 years and 10 years	
Between 11 years and 15 years	
Between 16 years and 20 years	
Between 21 years and 25 years	
26 years and above	

6. Years of Experience as a Project Manager

Between 1 years and 5 years	
Between 6 years and 10 years	
Between 11 years and 15 years	
Between 16 years and 20 years	
Between 21 years and 25 years	

26 years and above	

7. For Which of the following are you Representing in your capacity as PM

The Client	
Contractor	
The Government	
Other: Please specify……..	

8. No. Of Projects, you were involved in

9. How many of these projects were behind schedule?

(**Note:** *behind schedule – refers* to *projects that exceeded the contracted construction period, where the delay was caused by avoidable factors – due to the client, the consultant or contractors incompetence or negligence*)

10. On average, by how many months were these projects delayed

SECTION B: ESTABLISHMENT OF THE INITIAL CONSTRUCTION TIME PERIOD

This section of the questionnaire explores how the initial construction period that the contractor uses as a base of the construction schedule is determined

Please Tick the relevant answer where applicable:

11. Who determines the initial construction schedule?

The Client	
The Contractor	
The Consultant – The Project manager	
The Consultant – Other consultants	
Other: Please specify ……	

12. Are there guidelines that are used to determine the construction schedule

Yes	No

If Yes, please specify:

……
……..

13. If Yes, please state in your opinion whether these guidelines are effective or not

……
……

SECTION C: COUSES OF CONSTRUCTION PROJECT DELAY

This section of the questionnaire explores the causes of schedule overruns in construction project delivery time in South Africa

To what extend do you agree with each of the following statements? Please indicate your answer using the following 5-point scale (Tick the correct Box):

1 = strongly disagree (SD)

2 = Disagree (D)

3 = Neutral (N)

4 = Agree (A)

5 = Strongly Agree (SA)

14. What are the overall common causes of schedule overruns in SA?

Category	No.	Causes of schedule overruns	SD	D	N	A	SA
Client Related Factors	1	Delay in Progress Payments					
	2	Delays in Handing over the site					
	3	Design changes by client during construction					
	4	Delays in approving drawings and materials					
	5	Slow decision-making process					
	6	Poor communication by the client to the consulting and construction team					
	7	Poor project co-ordination					
	8	Unrealistic project completion periods					
	9	Suspension of works by owner					

Category	No.	Causes of schedule overruns	SD	D	N	A	SA
Contractor Related Factors	1	Delays in site mobilization					
	2	Difficulties in Financing project					
	3	Un-realistic construction programme					
	4	Conflicts in subcontractor's schedule					
	5	Rework due to construction errors					
	6	Conflicts between contractor and other parties to the project					
	7	Poor communication or co-ordination					
	8	Construction methods					
	9	Lack of relevant experience					
	10	Delay in sub-contractor work					

Category	No.	Causes of schedule overruns	SD	D	N	A	SA
Consultants related factors	1	Delay in approving major changes in the scope of work					
	2	Poor communication and coordination					
	3	Inadequate experience of consultants					
	4	Mistakes and inconsistencies in the design					
	5	Unrealistic determination of construction programme					
	6	Delays in producing design documents					
	7	Unclear and inadequate details in drawings					
	8	Lack of advanced engineering design software					
	9	Lack of relevant construction experience					

Category	No.	Other Factors	SD	D	N	A	SA
	1						
	2						
	3						
	4						
	5						
	6						
	7						
	8						
	9						

Comments:

……

……

……

……

……

……

……

……...

Thank You for your participation

Annexure 6: Ethics Application Form

PROTOCOL NUMBER (for office use only): _____

University of the Witwatersrand, Johannesburg

Ethics Application Form for School of Construction Economics and Management Ethics Committee

Use this form in applying for clearance of research involving human participants

Instructions

1. Completed applications must be submitted to Mantiseng Sithole at the CEM reception desk
2. Four paper-based (hard) copies of each document must be submitted.
3. All submissions and materials must be typed. Handwritten submissions are NOT acceptable.
4. Incomplete applications will NOT be considered.
5. Applications will NOT be processed if signatures from applicant or supervisor are missing.
6. Photocopying should be done 'back-to-back' to save paper.
7. Glossy and fancy binding is NOT necessary.
8. Necessary supporting documents (e.g. *Participant Information Sheet, Consent Form*, copies of instruments), must be stapled to the *Ethics Application Form.*
9. Please ensure the order of the documents being submitted are – Application form, participant information sheet, Consent form, copies of instruments and the research proposal

Complete this checklist to show what documents you have submitted.

✓

Check list

For all research:

✓	Completed *Ethics Application Form*
✓	Copies of the research proposal
✓	Copies of proposed research instruments (e.g. questionnaires/interview schedules)
✓	*Participant Information Sheet* (for each different sample group)
✓	*Consent Form* [*Assent Form* for under 18s] (for participant's signature) (for each different sample group)

Where applicable (Attach to this form):

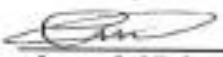
	Relevant permission letter (from, e.g. company's HR department, National authorities such as Education Departments, Health Centres, Correctional Services, landowners, University Registrars, School principals, etc.)
	Any other appropriate *Consent Forms* (e.g. for members of focus groups, etc.)
	Guardian *Consent Form* (for participants under the age of 18)
	Other (please specify)

Declaration

I recognise that it is my responsibility to conduct my research in an ethical manner according to Guidelines of the University of the Witwatersrand, according to any laws and/or legal frameworks that may apply, and according to the norms and expectations of my discipline.

In preparing this Application for Ethics Clearance form, I have consulted the ***Guidelines for Human Research Ethics Clearance Application /non-medical*** (available on this web site http://web.wits.ac.za/Academic/Research/Applications.htm) and have familiarised myself with the ethical guidelines specific to my discipline.

SCEM Ethics Committee (Non-Medical) Ethics Clearance Application

Signature 

Name of researcher/applicant: Amanda Viola Mavasa: 315782

1. Researcher's personal data

Surname:	MAVASA			Name:	AM ANDA				
Title:	☐ Prof	☐ Dr	☐ Mr	☒ Ms	☐ Mrs	☐ Other:			
School:	Construction Economics and Management								
Staff / Student number:	315782			☐ Full time	☒ Part time	☐ Staff			
Your telephone(s):									
Your Email:	amandaviola.mavasa@gmail.com								
Name of Supervisor (if applicable):	Dr. Stephen Allen								
Supervisor's email address:	stephen.Allen@wits.ac.za								
Supervisor's tel. number(s):									

2. Specifics about the research project

Title of research project

Title: The Influence of unrealistic initial contract duration on Time In South Africa

Is this research for degree purposes?	☑ Yes	☐ No		
If so, for what degree?	☐ Honours	☑ Masters (research report)		
Other (please specify)				
Has it been approved by the relevant higher degrees committee or other relevant unit?	☐ Yes	☐ No	☐ Submitted & pending	

List the names and affiliations of any *additional* researchers who will be covered by this ethics protocol

Where will the research be carried out?

Johannesburg - South Africa

What are the aims / objectives of the research? (Pleas-e list; be brief)

The Aim of the research is to determine the impact or unrealistic initial construction programmes on time.

Objectives:

1. Investigate how project managers or project planner determine the initial construction time periods.
2. Investigate how the three industry participants i.e. the contractor, the consultants and the client contribute to project delay due to unrealistic construction time periods.
3. Investigate the impact of poor scheduling on time.
4. Investigate what can be done to assist inexperiesced consultants in determining construction time periods.

Do you have any financial or material interest associated with your research participants or with the organisations that you will work with during your research?

☐ **Yes**	☒ **No**	☐ **Potential conflicts of interest may exist**

Please explain how you will manage any existing or potential conflicts of interest, if applicable.

INFORMATION RELATING TO ETHICAL MATTERS

Protocols submitted to the Committee must have sufficient information to enable the committee to judge the ethical implications of the proposed research. Please be brief and concise but also as specific and informative as possible

3. Formal permission

Has appropriate formal permission been obtained, if required (e.g. employer, government department, land owner, etc.)?

☐	Yes (attached)	☒	Not required	☐	Pending (must be supplied before permission is granted)

Obtaining permission is necessary when conducting research *within the premises* of a particular site such as an ethnography of the functioning of a supermarket or a school, or the way staff interact with clients in a clinic, or of how the HIV Unit in the City of Johannesburg functions. Please read the detailed guidelines on the Ethics website http://web.wits.ac.za/Academic/Research/Applications.htm

4. How will data on human research participants be collected (instruments, methods, procedures)? (Attach instruments as an appendix)

☒	In written format (e.g. questionnaires, diagnostic tests, etc.)
☐	Completion of on-line instruments (e.g. questionnaires)
☐	Individual interviews (e.g. structured, semi-structured, etc.)
☐	Group interviews (e.g. seminar/discussion groups, focus groups, etc.)
☐	Ethnographic observation, participant observation, other informal descriptive, and/ or interactive methods
☐	Community-based methods or techniques such as drama workshops, community theatre, fc0 w.orkshops, participant rural appraisal (PRA), rapid rural appraisal (RRA), etc.
☐	Research on/in therapeutic or counselling contexts
☐	Observation of public performance, and/or public behaviour observation
☐	Photography, video and/or audio recording (ensure permission is signed for on the *Consent Form*)
☐	Other research methods or techniques (specify in this line).

Brief details of instruments to be used (attach instrument or draft to this application)

5. Who will the research participants be?

Brief description of human participants, including age range and sample size, for each sample: Project Managers, Registered with the SACPCMP as PPM, residing in Johannesburg, Gauteng, doing Projects in Gauteng

Does this research expose either the participant or the researcher to any potential risks or harm that they would not otherwise be exposed to?	☐	**Yes**	☒	**No**

If 'yes', explain:

Will research involve vulnerable categories?	☐ Yes	☒ No
If so, state which ones:		
How will any existing vulnerabilities among research participants be addressed?		

NB: The term 'vulnerable categories' includes, among others, children under 18, orphans, prisoners, persons with cognitive or communication disorders, people who are traumatised or currently in traumatic situations.

Where necessary, include details of steps to be taken to facilitate data collection across language barriers (e.g. interpretation or translation).

6. How will informed consent be obtained?

How will potential participants be identified / selected / recruited?

The SACPCMP selects the names of Required candidates, and when requested, the give the email adresses of the candidate, information will be obtained there.

What will participants be told about the research (including the promises to be made)?

Details written in the letter (see attached)

How will informed consent be obtained?

☒ Formal (Signed form) ☐ Informal (e.g. verbal) ☐ Other

Briefly explain your strategy for ensuring informed consent

I will be first send an email, with the letter to request for consent, there after, the Ques together with the Questionnaire.

Attach *Participant Information Sheets* and *Consent Forms* for each sample group, and/or other related materials

NB: *Consent* in social science and humanities research involving human participants: Where informal ethnographic or participant observation methods are used, or where signed *Consent Forms* are not possible, or for research involving group contexts (focus group, Participant Rapid Assessment, Rapid Rural Appraisal, public performance, workshops) state how the quality of informed consent will be assured. It is essential that participants in research be fully informed and agree, on this basis, to participate in the research.

7. Protecting participant identities				
Can anonymity be guaranteed in resulting reports, theses and/or publications?	X	Yes		No
Can confidentiality be guaranteed?	X	Yes		No
Explain how this will be done? (What will participants be told in this regard?)				
The participants are not required to fill in their personal details.				

NB: While confidentiality may be desirable, it cannot be guaranteed in, for example, focus groups, or ethnographic observation. Similarly anonymity should be preserved in questionnaires, but cannot be offered in workshop methodologies, focus group research, etc. Participants should have the right to remain anonymous in the final report, and this must be respected in handling of all data relating to them. Participants need to be informed about these issues.

8. Protection of data during and after the research			
How will the data be protected while the research is in progress? (This includes how the identities of participants will be protected).			
The Questionnaires doesn't have ask personal details that can be used to identify an individual			
What is to be done with the research data after completion of the project?			
	Stored in archives (specify)		Stored in on-line data base (specify)
X	Stored in password protected computer		Stored in digital form with all identifying feature removed
X	Destroyed after 1 years (insert numbers of years)		
Explain how the data will be securely stored during this time			
It will be stored in a password protected folder, in a personal external hard-drive.			

NB: 'Raw' or unprocessed data, especially where the identity or personal data of research participants is included, must be safeguarded and preserved from unauthorised access. Data may be destroyed after use, but preservation in an archive or personal collection may also be appropriate, desirable or even essential. For instance, data sets that contain historically important information or information that relates to national heritage must be preserved and should be placed in a public archive where possible and appropriate.

All data should be preserved in a way that respects the nature of the original participants' consent. If you are unsure about the procedure of data management and storage, please contact Nina Lewin (ninalewin@gmail.com)

9. Access to the research results / reports
How will the results be reported?
Who will have access?
The School

Note: All Wits Masters and PhDs are stored in the main library as well being made available on the www.

SIGNATURES (REQUIRED)

By signing this form the researcher and supervisor (if any) of this project undertake to ensure that any amendments to this project that are required by the Human Research Ethics Committee (Non-medical) are made before the project commences.

SCEM Ethics Committee (Non-Medical) Ethics Clearance Application

Declaration: We, the signatories, declare that all information on this form is correct and that we will strive to maintain the highest ethical standards in this research at all times, according to disciplinary and university expectations, recognising that ethical practice in research is always a continuing process.

	Date	Name	Signature
Applicant	07/07/2016	Amanda. J. Marcotti	
Supervisor	14/09/2016	STEPHEN ALLEN	

SCEM Ethics Committee (Non-Medical) Ethics Clearance Application

Declaration: We, the signatories, declare that all information on this form is correct and that we will strive to maintain the highest ethical standards in this research at all times, according to disciplinary and university expectations, recognising that ethical practice in research is always a continuing process.

	Date	Name	Signature
Applicant	01/11/2016	Amanda. V. Manasa	
Supervisor	14/09/2016	STEPHEN ALLEN	

Annexure 7: Ethics Clearence

School of Construction Economics & Management

University of the Witwatersrand, Johannesburg ·PO Box 20, Wits 2050, South Africa · Tel: +27 (0)11 717 7652/7669 · Fax: +27 (0)11 717 9729 Email:CEM@wits.ac.za

SCHOOL OF CONSTRUCTION ECONOMICS AND MANAGEMENT RESEARCH ETHICS COMMITTEE

CLEARANCE CERTIFICATE — **PROTOCOL NUMBER** CEM/16/08/AVM/MSC

PROJECT TITLE — The Influence of unrealistic initial contract duration on Time in South Africa

INVESTIGATOR — Amanda Viola Mavasa 315782

SCHOOL/DEPARTMENT — **SCHOOL OF CONSTRUCTION ECONOMICS AND MANAGEMENT**

DATE CONSIDERED — 1/8/2016

DECISION OF THE COMMITTEE
EXPIRY DATE — 8th August 2017

DATE 09 August 2016 — **CHAIRPERSON**
Dr. Kola Ijasan

cc: Superyisor: Dr. Stephen Allen

DECLARATION OF INVESTIGATOR (S)

To be completed in duplicate and **ONE COPY** returned to the Secretary Mrs. M. Sithole at the CEM reception desk.

I fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with those conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to completion of a yearly progress report.**

Signature — **Date** 13 / 07 / 2016