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# Examining Causes for Cost Overruns in Projects at Transnet Port Terminals


**By**

**Sifiso Sibusiso Mavuso**

**961060501**

**College of Law and Management**
**Graduate School of Business and Leadership**


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**Supervisor**
**Professor Mihalis Chasomeris**

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# DECLARATION

I, Sifiso Sibusiso Mavuso, declare that

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ii. This dissertation has not been submitted for any other degree or examination at any other university.

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## ACKNOWLDGEMENTS/DEDICATIONS

I dedicate this dissertation to:

- Firstly, to God through my saviour Jesus, the soon coming Christ. He has afforded me the opportunity to complete it. Indeed, the Scripture is true in Philippians 4:13, when it says, “I can do all things through Christ who gives me strength”.

- Secondly, to my wife and our four daughters, Nomaswazi, Emihle, Azande and Lizwi. I want to thank them for their support throughout this journey. It was not easy coming home very late at night and spending weekends away without them. I thank you guys for your patience, love and support.

- To my supervisor Professor Mihalis Chasomeris. Thank you for your guidance and support. Your professionalism and kindness is beyond words. You not only touched my academic life but you have inspired my whole life. Thank you a million times.

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May God bless you all in the name of our Lord and saviour, Jesus the soon coming Christ, Amen.

…….

Sifiso Sibusiso Mavuso

# ACRONYMS

| | |
|---|---|
| AGRI | Agriculture |
| BSC | Bid Specifications Committee |
| CAPIC | Capital Investment Committee |
| CTCT | Cape Town Container Terminal |
| EME | Emerging Micro Enterprises |
| ETC | Estimated Total Costs |
| FEL | Front End Loading |
| FY | Financial Year |
| GDP | Gross Domestic Product |
| MPT | Multi-Purpose Terminal |
| OEM | Original Equipment Manufacturers |
| OHS Act | Occupational Health and Safety Act No. 1 of 1999 |
| PPPFA | Preferential Procurement Policy Framework Act of 2000 |
| PMBOK | Project Body of Knowledge |
| PLP | Project Life Cycle Process |
| PFMA | Public Finance Management Act |
| ORS | Owner Requirement Specification |
| RCB | Richards Bay |
| SOE | State Owned Enterprise |
| SLD IOT | Saldanha Iron Ore Terminal |
| TE | Transnet Engineering |
| TPT | Transnet Port Terminals |

# ABSTRACT

Cost overruns in projects is a problem worldwide. Many State Owned Enterprises fail to complete projects within the allocated time and budget. Cost overruns have severe consequences for organisations, tax payers and the economy. Transnet Port Terminals is no exception to this problem. It incurs millions of rand annually on project cost overruns. The aim of this study is to quantify the project cost overruns for TPT, incurred during the 2015/16 to 2018/19 financial years (FY) and to examine the causes of the cost overruns. Secondary data from the TPT Projects Repository and project reports like business cases, minutes, and resolutions are analysed using thematic analysis and descriptive statistics. Fifteen interviews conducted with Project Managers, Business Case Writers, Planners, Engineers and Financial Managers provide practitioner insights on the causes of cost overruns. The results reveal that in the period under review, TPT had 22 projects with cost overruns, amounting to: R732 million (2015/16 FY); R32 million (2016/17 FY); R1,2 billion (2017/18 FY) and R83 million (2018/19 FY). The 22 projects exceeded their original budgets by a range between 10% and 200%. The study reveals that the prominent causes of project cost overruns at TPT are: (1) a lack of project management skills, especially cost engineers and quantity surveyors; (2) inadequate engineering studies; (3) project approval and procurement delays; (4) poor maintenance regime; (5) poor scope definition; and (6) over-regulation of the supply chain process. The main recommendations of the study are: (1) TPT should capacitate the projects department with relevant essential skills which include amongst others, cost engineers and quantity surveyors to assist with bills of quantities and budget estimation. (2) Complex projects should be supported by adequate engineering studies to ensure that the scope of work is complete and robust. (3) TPT should develop a strong relationship with National Treasury in order to find ways to deal with over-regulation and inflexibility in the supply chain process. (4) TPT's maintenance department should adopt the Asset Management Life Cycle in order to ensure that assets are professionally and adequately mantained throughout their useful lives.

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# CHAPTER ONE

# INTRODUCTION

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## 1.1. Introduction

During the 2012 State of the Nation Address, the then state president Mr. Jacob Gedleyihlekisa Zuma announced a R300 billion Market Demand Strategy for Transnet Ltd a State Owned Enterprise (SOE) (Mokone, 2012). The funds would be spent on a capital-expansion programme to upgrade aging port and rail infrastructure. The president stated that the funds would be split in the following way: R200 billion would be spent on the rail network and the remaining R100 billion would be spent on port projects (Mokone, 2012).

TPT is an operating division of Transnet. It operates 16 terminals in the Richards Bay, Durban, East London, Port Elizabeth, Cape Town and Saldanha ports. It has a massive fleet of port equipment which includes, Ship to Shore Cranes, Rubber Gantry Tire Cranes, Rail Mounted Gantry Cranes, Straddle Carriers, Ship Loaders and Unloaders, Grain Elevators, Tipplers and so forth. According to the TPT's "Annual Capital Expenditure Plan" for the financial years; 2015/16 to 2018/19, TPT had the following approved capital budgets: R1,5 billion for 2015/16 FY, R1,9 billion for 2016/17 FY, R1,5 billion for 2017/18 FY and R2,7 billion for 2018/19 FY (TPT, 2016 – 2019). TPT spends billions of rand annually on projects and this study aims to investigate the causes of cost overruns within these projects.

Abd El-Karim et al. (2017) define successful projects as those that meet the business objectives and are delivered within budget and schedule. Organisations throughout the world spend billions of rand annually on capital investment programmes to improve infrastructure, grow the economy and create job opportunities (Love et al., 2016). Ports are a vital link for global trade and therefore the condition and performance of their infrastructure and

equipment is of paramount importance, not only to their countries but to the world at large. Therefore, port infrastructure may be viewed as an engine for economic growth. Since ports are SOEs, failure to complete port projects within allocated budgets and time limits often attracts attention from media, society, politicians and the public in general (Love et al., 2016). Cost overruns at the Sasol's Lake Charles Chemicals Project in the United States, where the company lost about R54 billion, attracted media (Gernetzky, 2019). Cost overruns for well-known public projects in Australia such as Melbourne's Southern Cross Railway Station and Sydney's Cross City Tunnel have attracted negative media attention (Love et al., 2016).

Project cost overruns for mega projects can have serious consequences for both investors and tax payers (Love et al., 2016). Shipping lines are losing $30 000 a day as a result of port inefficiencies and aging equipment at the TPT Durban Container Terminal (Huston, 2019). TPT's projects are undertaken to revitalise both port infrastructure and equipment in order to achieve the required level of port efficiencies. Therefore, successful completion of port projects is vital for the economy and the tax payers. This is in addition to saving port users a lot of money.

Evidence from past studies reveals that most organisations including ports, often fail to complete projects within budget, resulting in cost overruns (Love et al., 2016). Cost overruns are a chronic problem worldwide (Cheng, 2014). TPT is not immune to this problem. It is battling to complete projects within allocated time and budget. This study will examine the causes of project cost overruns at TPT.

TPT has an in-house projects team which is responsible for the management of projects. The team's responsibilities include the following tasks amongst others: business case writing to motivate for new projects, project planning and execution, monitoring and reporting of project activities. The actual execution of projects is outsourced to various external contractors through an open tender process. TPT relies on its sister operating division, Transnet Group Capital for the engineering, procurement and contract management

services of civil projects. Rehabilitation, Maintenance and Emergency Services, another TPT's sister division is sometimes given preference to bid for equipment related projects. This is done in order to create manufacturing competency and capacity within Transnet.

## 1.2. Problem statement and motivation for the study

Investment in port projects is important to ensure that the port's infrastructure and equipment is able to meet the demands of the economy and reduce inefficiencies in the handling of cargo. Port inefficiencies can cost individual organisations and the economy a lot of money. According to Huston (2019) shipping lines lose $30 000 a day due to berthing delays at the Port of Durban. These delays are caused by amongst other factors, aging equipment (Huston, 2019). TPT spends billions of rand annually to execute capital projects aimed at refurbishing aging equipment and acquiring new in order to improve port performance. However, TPT battles to complete some of its projects within the allocated time and budget. Whilst there are recorded reasons for the cost overruns in the various TPT business cases, however, the researcher is not aware of any form of study that has been performed in the past to quantify them and to examine their causes. The aim of this study is to analyse the causes of cost overruns for TPT's projects.

Previous research studies across different industries, including ports, suggest that the following causes amongst others contribute to cost overruns: poor scope definition; unreasonable cost estimates; design changes; lack of project management skills; delays in the approval process, procurement delays and so forth (Mukuka et al., 2015). This study will examine whether these causes may have contributed to cost overruns at TPT.

## 1.3. Research objectives

The following are the main objectives of the study:

- To quantify the total Transnet Port Terminals project cost overruns for the financial years: 2015/16 to 2018/19; and
- To identify and analyse the causes of project cost overruns for Transnet Port Terminals for the financial years: 2015/16 to 2018/19.

## 1.4. Questions to be answered in the research

The study attempts to answer the research questions below.

- What are the total cost overruns for TPT projects incurred during the financial period: 2015/16 to 2018/19? and
- What are the most common causes of the TPT's project cost overruns?

## 1.5. Research methodology

The study began with relevant literature review of articles, journals and books on the topic of project cost overruns. The literature review provided insight about what has been discovered by international studies and their recommendations on how to reduce cost overruns. The results of the literature review were used to form a framework for the study. Sekaran and Bougie (2014) state that there are several methodologies which can be used to perform research. They mention that the researcher may use qualitative, quantitative or mixed methods. This study used the mixed method approach to analyse data.

The research included analysis of the existing TPT Projects Repository (TPT 2019) in order to identify and quantify projects which incurred cost overruns. Relevant data was extracted from the business cases, minutes and resolutions of the Capital Investment Committee (CAPIC) in order to examine the causes of the cost overruns. In addition, interviews were conducted with 15 experienced relevant TPT managers, which included: Project Managers, Planners, Chief Engineers, Business Case Writers and Financial Managers to obtain their insights on the causes of cost overruns for TPT's projects.

A thematic approach is used to analyse data recorded on the business cases, CAPIC minutes and resolutions and the results of the interviews with the 15 interviewees. The causes of project cost overruns are extracted from the primary and secondary data sources and are coded into different themes. The results of the literature review are compared with the study results in order to present a balanced view of the causes of cost overruns at TPT.

### 1.6. Study location

The entire study was performed at TPT Head Quarters in Durban Kingsmead where the TPT Projects Repository (TPT 2019), business cases, CAPIC minutes and resolutions are kept. The study location was therefore selected because of the availability of information and easy access to relevant interviewees.

### 1.7. Structure of dissertation

**Chapter One**: The first chapter includes the introduction into the study, background about TPT where the study will be performed, the problem statement, motivation for why the study was undertaken, research objectives, research questions, study limitations and conclusion.

**Chapter Two**: This chapter focuses on a detailed literature review, on the causes of project cost overruns. The literature review will form the basis which will underpin the investigation and will highlight key areas of focus which contribute to understanding project costs overruns. The literature review is structured as follows: extent of cost overruns, project life cycle process, definition and measurement of cost overruns, causes of cost overruns, project cost estimates, project contingency, risk management, scope management, design changes, project approval delays and project resource management.

**Chapter Three**: The emphasis of this chapter is on the research methodology selected, research design, data sources, data collection, research instruments, data analysis, validation and reliability of data. Justification for the research method selected is provided in this chapter.

**Chapter Four**: The focus of this chapter is on the quantification of cost overruns from the TPT Project Repository and the analysis of the causes of project cost overruns from the business cases, minutes and resolutions of CAPIC and from the interviews with knowledgeable TPT senior managers. The causes are discussed thematically and coded into different themes.

**Chapter Five**: The emphasis of the chapter is on the discussion of the findings and interpretation of the results. The study combines and discusses findings from the business cases, minutes and resolutions of CAPIC, interviews with TPT senior managers and the literature review. The findings from these sources are compared and discussed to present a balanced view of the causes of project cost overruns at TPT.

**Chapter Six**: The final results of the study, findings and recommendations are presented. In addition, conclusions are deducted from the findings and recommendations for future studies are made.

### 1.8. Study limitations

The study had the following limitations:

- The data in the TPT Projects Repository was not structured and organised in a simple way. A lot of time was spent in re-organising the data.
- The review period to 2018/19 financial year had to be extended because some of the projects which were selected were still being executed in 2018/19. In addition, some of the cost overruns started prior to the 2015/16 financial year, therefore, they had to be identified and examined.
- It may be possible that certain decisions were taken subsequent to the approval of increases in estimated costs for some of the projects. This

study did not go back to assess how those decisions were implemented and how they affected the approved project budgets.

- It was a challenge to get the study participants to sit down for the interviews due to their work commitments. They kept on postponing the interview dates. However, all of them were interviewed.

## 1.9. Conclusion

This chapter provided an overview of the study, by looking at how poor project management in general impacts on port efficiencies and the economy at large. TPT in particular is under severe pressure from shipping lines to improve its port efficiencies. Some of the complaints raised by the shipping lines include that there is poor maintenance of port equipment in TPT. TPT's projects are aimed at refurbishing the equipment to ensure that it is reliable. However, TPT is battling with cost overruns. The study aims are to quantify project cost overruns for its projects for the financial years: 2015/16 to 2018/19 and to examine the causes of these overruns. The study aims will be achieved through an analysis of the TPT Project Repository (2019) which contains data on cost overruns as well as an analysis of business cases, CAPIC minutes and resolutions and by interviewing knowledgeable managers in TPT to get their perceptions on the causes of cost overruns. A mixed method approach is used for the study. The next chapter will review literature on cost overruns.

# CHAPTER TWO

# LITERATURE REVIEW ON PROJECT COST OVERRUNS

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## 2.1. Introduction

This chapter examines literature on the various causes of cost overruns in projects. The literature review seeks to give insight into the factors that cause projects to exceed the approved original budget. The literature review covers the following topics: causes of cost overruns; project scope management; project cost estimates; cost contingency; design changes; project management skills; risk management; project approval delays and the procurement process. The study seeks to evaluate the extent to which these areas have contributed to project cost overruns in TPT.

The available literature focuses on construction and transport projects. In many instances transport includes port and rail infrastructure. Therefore, the literature review explored a wide variety of studies from the construction and transport industries in general.

## 2.2. Extent of the problem

“Cost overruns in projects is a chronic problem for most projects” (Cheng, 2014, p.850). Despite all the research that has been done on the factors which contribute to project cost overruns, the problem still remains pervasive throughout the world (Love et al., 2012). Investment in infrastructure, which includes: ports, railway, roads and bridges is paramount in order to meet the needs of the growing economies (Love et al., 2016). According to Waithera and Susan (2017), governments are known to be the main investors in infrastructure projects. Governments spend between 15% and 45% of GDP on infrastructure projects (Waithera and Susan, 2017). Cost overruns have a significant impact for organisations, the economy and tax payers (Love et al.,

2016). Failure to complete projects within budget and time could have severe financial consequences for the economy, investors and tax payers (Flyvberg et. al., 2018). In South Africa cost overruns have affected both private and public companies. According to (Dlamini, 2019), Eskom wasted billions of rand of taxpayer's money because of project cost overruns during the construction of the Kusile and Medupi power stations. The Sasol's Lake Charles Chemicals Project in the United States of America was initially planned to be completed at a cost of R130 billion, however, it ended up being estimated to be completed at a total cost of between R184 billion and R189 billion (Gernetzky, 2019). According to Gernetzky (2019) the project had the following impact:

- It lost a third of its share price;
- Its earnings before interest and tax fell by 45%;
- The shareholders did not receive dividends; and
- Sasol's chief executive officers had to resign over the cost overruns.

Despite the big funds involved in infrastructure projects there is still little knowledge regarding the causes of project cost overruns (Flyvbjerg et al., 2003 & Love et al., 2016). According to Love et al. (2016), past research studies on the topic have been focusing on a deterministic approach instead of a probabilistic or plural approach that examines the problem holistically and includes an understanding of the interdependencies of the causes.

Cheng (2014) states that researchers have arrived at different conclusions regarding the percentage of cost overruns in projects but all agree that most projects incur overruns. Some researchers have concluded that the size of the project does not matter when it comes to cost overruns as there is no correlation between the two factors (Cheng, 2014). Some projects which started very small ended up over-spending (Cheng, 2014). Abd El-Karim et al. (2017) claim that approximately 90% of road and 45% of rail projects are subject to cost overruns.

Cost overruns in developing countries sometimes exceed 100% of the initial estimated costs (Waithera & Susan, 2017). Habibi and Kermanshachi (2018)

mention that approximately 50% of projects incur cost overruns, resulting in project delays and reputational damage for the industry concerned. In their study which involved 276 construction and engineering projects, Love et al. (2012) conclude that the cost overruns mean was 12,72%. They also find that the type of project, project size and procurement process did not have an influence on the cost overruns.

Cantarelli et al. (2013) provide a view of the extent of the problem from past studies conducted:

- About 77% of the transport projects in the United States of America experienced cost overruns;
- The average cost overruns for construction projects is more than 50%; and
- More than 3 500 projects reported that cost overruns ranged between 40% and 200% of the project budget.

## 2.3. Project Life Cycle Process

PMBOK (2013) defines a project as a planned activity carried out with the aim of creating a product or delivering a needed service within approved time and budget constraints. Skills, tools, knowledge, experience and other resources are assembled and organised to deliver the project (PMBOK, 2013). To fully appreciate of the causes of cost overrun, it is important to first understand the project life cycle process as defined by PMBOK (2013).

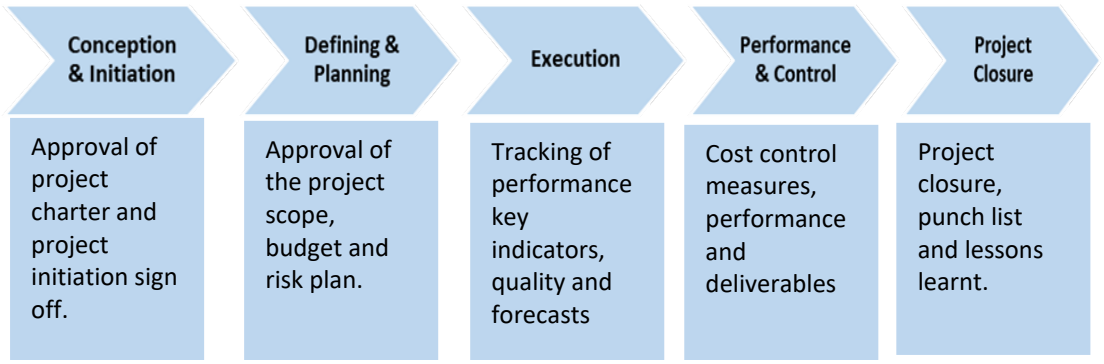


Figure 2.1 Five phases of project management

Source: Author compiled from PMBOK (2013).

As shown in Figure 2.1, a project starts with a concept. This includes a project charter which defines the purpose for the project, lists the stakeholders and outlines the various roles and responsibilities of key players. The next phase is definition and planning which includes the scope definition, designs, budgets or estimates and breaking down the project into work breakdown structure packages such as planning, risk management and so forth. The next phase is the project execution. It is important that during execution phase, the project deliverables are monitored and all deviations are reported. The last phase is the project closeout phase where commissioning takes place and lessons learnt during the project are shared for future improvement.

TPT follows a Project Life Cycle Process which has the following phases (Transnet PLP, 2015):

- Front End Loading (FEL) 1 – This is a concept phase where the concept for the project need is developed. There is not much information available during this phase.
- FEL 2 – This is the feasibility study phase where different options to solve the problem are identified. The best option is chosen based on various studies, including an assessment of whether the project fits with the strategy of the organisation. It is during this phase that a detailed scope of work is developed based on the viable option.
- FEL 3 – This is the design phase where the best design for the project is developed. The design has to be practical, feasible, economical and must solve the problem.
- FEL 4 – This is the project execution phase. The service provider who will deliver the project is selected, the execution plan or method statement is developed. The phase ends with the commissioning of the project to ensure that the end user tests it for acceptability.

It appears that the Transnet PLP (2015) is aligned to the PMBOK (2013).

## 2.4. Definition and measurement of cost overruns

It is important to have a common understanding of the definition of cost overruns so that it can be consistently measured. There are different definitions based on literature and the implications are different based on each definition. According to Mukuka et al. (2015), when a project is completed at a cost which exceeds the original approved budget, it is said to have incurred a budget overrun. According to Cantarelli et al. (2013, p. 4) “project cost overruns are measured as actual out-turn costs less estimated total costs expressed as a percentage of estimated total costs”. According to Love et al. (2013) there is a difference between cost overruns and budget increase. The former is not anticipated whereas the latter is anticipated e.g. inflation, foreign exchange fluctuations and so forth (Love et al., 2013).

Love et al. (2016) bring in a new dimension into the discussion. They argue for a probabilistic theory of measuring cost overruns. They mention that big projects go through a long definition process. The initial scope, design and budget are based on a concept which can change in the future as new information about the problem becomes available. The time between the approval of the original budget and the time when the construction contract is signed with the bidder might be too long. During that time, material prices might have increased and other unforeseen costs might be incurred. Love et al. (2016) argue that it would therefore be misleading to use the initial approved budget to calculate project cost overruns.

According to Brüggen and Luft (2015) capital budgets for projects spanning multi-periods of time tend to be underestimated. According to Senouci et al. (2016) short term projects tend to be completed within budget while long term projects do not.

Invernizzi et al. (2018) seem to agree with the argument by (Love et al., 2016). They argue that when a project is at the concept stage, there is not enough information to determine a realistic final budget and therefore a lot can still change as the project advances to the next phases. Love et al. (2016)

therefore argue that a reference point for defining cost overruns should be at the final stages of project planning, where there is certainty about the project design, and when specifications and final costs have been firmed up.

Flyvbjerg et al. (2018) mention that the measurement of cost overruns depends on what needs to be measured. If management wants to measure the effectiveness of their decision making, then the original budget may be used and compared with the actual final costs of completion (Flyvbjerg et al., 2018). However, if a contractor's performance needs to be measured, then the contract value awarded to the bidder can be compared to the final costs of completion (Flyvbjerg et al., 2018).

Lind et al. (2015) identified the stages where cost overruns should be measured, in the study titled "Explaining cost overruns in infrastructure projects: a new framework with applications to Sweden":

- Stage 1 – The project idea stage. Cost estimates should be measured at the end of the pre-feasibility stage, just after the project approval is given.
- Stage 2 – The project design stage as more design information becomes available.
- Stage 3 – The procurement stage. The price of the bid can be higher than the project budget.
- Stage 4 – The construction stage, where the contractor has been appointed and awarded the contracted.

Transnet PLP (2015) appears to be aligned to the framework above. Each FEL phase has its own approved budget. This makes it easy to contain the project budget within each phase. It is only once each phase is complete that a budget for a new phase is approved.

Flyvbjerg et al. (2018) mention that studies seem to conclude that the simplistic way of measuring project cost overruns is to compare the initial approved budget with the final project costs incurred. However, this may vary from organisation to organisation depending on what management wants to measure (Flyvbjerg et al., 2018).

## 2.5. Causes of cost overruns

Determining the causes of project cost overruns remains a complex and challenging exercise (Ahiaga-Dagbui et al., 2017). Flyvbjerg et al. (2003) agree that the causes of project cost overruns are still not fully understood and there appears to be a lack of a universal framework for understanding them. Flyvbjerg et al. (2003) conclude that despite the large budgets involved in infrastructure projects, there is still little understanding regarding the prevention of cost overruns.

Abd El-Karim et al. (2017) argue that the key success for any project is that it needs to be completed within the planned cost estimates, time schedule and the required quality, safety and environmental standards. Deviations from any of the factors above will have an impact on cost overruns. Ebbesen (2013) illustrates the relationship between these factors using the Figure 2.2 which, is popularly known as the “Iron Triangle”.

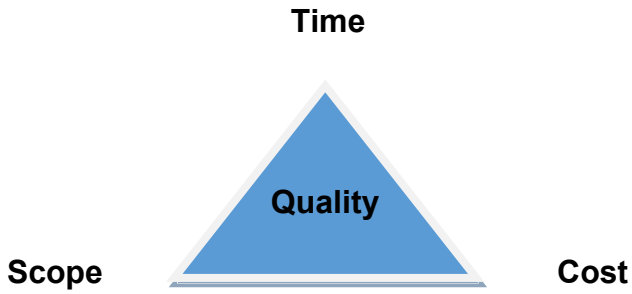


Figure 2.2, The Iron Triangle (Illustration of the relationship amongst time, cost, scope, and quality)
Source: Ebbesen (2013, p. 2)

The variables in the Iron Triangle often compete with each other and this may lead to imbalances and consequently cost overruns if not monitored. Habibi and Kermanshachi (2018) outline the importance of balancing the elements of the Iron Triangle in order to successfully complete a project. They postulate that if there is a problem with cost and schedule management, the project is likely to exceed the budget. In addition, they state that failure to manage the scope of work and quality will lead to unplanned activities and reworks.

Failure to manage scope, quality and costs will lead to time delays (Habibi and Kermanshachi, 2018).

According to Lee (2008) a study was performed for the Korean Social Overhead Capital Projects, which consisted of road, rails, airports and ports constructed between 1985 and 2005. It was discovered that the following causes amongst others contributed to cost overruns: adjustment to the project scope of work; project execution delays; unreasonable cost estimates; adjustment of the project costs; and lack of practical use of earned value management system (Lee, 2008).

Mukuka et al. (2015) identified the causes below, in the study titled “The effects of construction project schedule overruns, a case of the Gauteng Province in South Africa”. (1) Adjustment to the project scope of work; (2) Insufficient design at the time of tender; (3) Contractual and liability claims; (4) A lack of cost planning; (4) Poor control and monitoring of project funds; (5) Delays in the approval of cost variations; (6) Additional works; and (7) Errors in the contract and changes in approved drawings.

Waithera and Susan (2017) identified the factors below which affect cost overruns, in their study titled “Factors affecting cost overruns in construction projects, a case of Kenya National Highway Authority”: (1) A lack of experience and skills in managing complex projects; (2) Inexperienced contractors; (3) Project schedule delays; and (4) Government approval delays in areas such as licencing, permits and so forth.

Senouci et al. (2016) identify, amongst others, the following contributing factors to cost overruns:

- Awarding a contract to the cheapest bidder. Often times because they are desperate for work, bidders tend to under quote and end up not being able to deliver on the project or are forced to cut corners. This leads to reworks and increases in project costs;

- Incompetent contractors cost clients a lot of money due to poor workmanship which requires reworking at additional costs to what was originally budgeted;
- Poor site conditions are difficult to predict due to unknown conditions. These may include undetected underground services, a lack of drawings and hidden defects that only become apparent upon occupying the project site. These factors may result in additions to the scope of work and ultimately cause cost overruns.
- Inaccurate estimates can be caused by a number of factors, for example, a lack of experience within the project management team, over optimism, failure to identify risks and uncertainties.
- Changes in orders by the client. Sometimes clients request changes to the scope of work for various reasons such as changes in technology, changes in strategy and so on. Often if there is new technology which was not considered during project design, it would need to be accommodated in the scope of work. In other instances, if the business strategy changes, then the project scope may need to be modified to fit into the new strategy.

Daheshpour and Herbert (2018) in their study of infrastructure project failures in Colombia, identify poor documentation and technical designs/specifications as two of the causes which lead to project cost overruns. The knock on effect of these factors is increased pressure on service providers to complete the work based on the revised designs and this in turn results in to errors and further design changes (Daheshpour & Herbert 2018). They further state that constant changes in the scope of work created by poor workmanship by the contractor and the inability to complete projects on time are some of the significant causes of cost overruns (Daheshpour & Herbert 2018).

Mulla and Waghmare (2015) examined the causes of time and cost overruns for construction projects in India. They list the following significant contributing factors related to the project owner and appointed contractor:

- From a project owner’s perspective, additional work was highlighted as a significant contributing factor, specifically changes to the original design and drawings and indecisiveness; and

- From a contractor's perspective, time delays were identified as a contributing factor, specifically poor supervision and management of the project site and poor planning.

Abd El-Karim et al. (2017) provide a more structured approach to understand the categories and responsible parties for project cost overruns. They list four categories of factors which lead to cost overrun amongst others:

- Site conditions which include the following factors: unpredicted weather conditions, pollution, unexpected surface conditions, geotechnical investigations, site access delays, delays in obtaining permits, safety regulations and so forth.
- Resources which include: project management skills, equipment reliability, material availability and so forth.
- Project parties which are broken into four sub-categories: owner, engineering design, contractor and project management team. The following factors within the categories contribute to cost overrun: management strategy; organisational structure; project team experience; complexity of design; use of ad-hoc consultants; number of sub-contractors; number of projects per main contractor; type of contract; scope definition; variations and so forth.
- Project features which have the following categories: financial, political and schedule. The following factors per category contribute to cost overruns: foreign exchange complications; changes in regulations; fast tracking of the project schedule and so forth.

Flyvbjerg et al. (2003 in Cantarelli et al. 2013) elaborate on the framework shown on Table 2.1, which was developed to categorise causes of cost overruns:

Table 2.1 Causes and explanations for cost overruns.

| Category | Causes | Explanation |
|---|---|---|
| **Technical** | • Forecasting errors, price increases;<br>• Incomplete estimations,<br>• Design errors;<br>• Changes in scope of work;<br>• Poor planning;<br>• Uncertainty;<br>• Inappropriate organisational structures;<br>• Inadequate decision making process | Incomplete estimates, price increases and forecasting errors normally result from inadequate information and the difficulty of predicting what will happen in the future. Design errors are as a result of lack of experience among the project team. Inadequate decision making is associated with inefficiencies in organisational processes. |
| **Economical** | Deliberate underestimation due the following:<br>• Lack of incentives;<br>• Inadequate resources;<br>• Inefficient deployment of resources;<br>• Poor contract management;<br>• Poor financing;<br>• Behavioural issues. | Lack of funding creates competition among projects. The project teams tend to underestimate costs in order to improve the chances of their projects being selected. This causes problems later when actual costs exceed the budget. |
| **Psychological** | • Over optimism and bias by the project team which leads to unrealistic expectations and disregard of important facts | People tend to be biased when motivating for their projects to be selected. They become too cautious of the risks to the extent that they narrowly focus on maximising project benefits. This leads to underestimation of costs. |

| Category | Causes | Explanation |
|---|---|---|
| **Political** | • Manipulation of forecasts<br>• Deliberate underestimation of project costs<br>• Overestimation of project benefits | The manipulation of estimates to increase the chances of funding and to make the project to fit the strategic objectives of the organisation is high for most projects. |

Source: Author compiled from Cantarelli et al.; 2013, p.11.

There are four categories in Table 2.1, which have been identified as the main themes in the analysis of the causes of project cost overruns. This is a broad categorisation of the causes. The causes are categorised into technical, economical, psychological and political. This framework seems to introduce the soft issues caused by psychological and political factors.

The conceptual framework below is useful for understanding the relationships between independent and dependent variables that exist for cost overruns (Waithera & Susan, 2017).

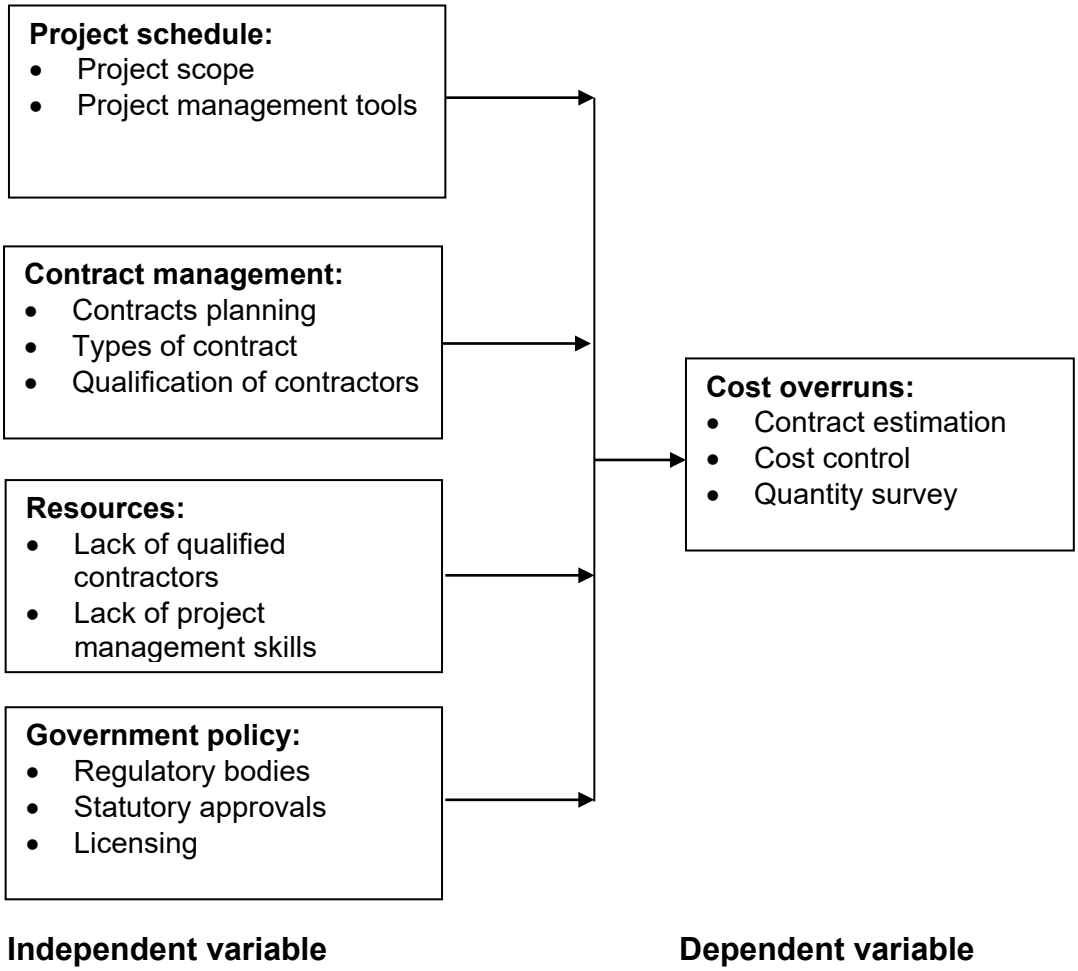


Figure 2.3. A Conceptual Framework for Causes of Cost Overruns.

Source: Waithera and Susan, 2017, p.174.

The framework in Figure 2.3, was developed after the research conducted on the rail and road projects in Kenya. The framework looked at the relationships between the independent and dependent variables responsible for cost overruns. Project schedule, management of contracts, project resources and regulatory policies were identified as independent variables. If any of these are not fully controlled, the result will be cost overruns. Cost overruns were identified as a dependent variable.

## 2.6. Project cost estimates

The process for determining cost estimates is one of the most critical activities for a project to be successful (Memon et al., 2011). One important question which needs to be answered in this study is whether project cost estimates are reasonable. Many studies have emphasised the need to get cost estimates right in order to prevent cost overruns. Incorrect cost estimates are the biggest risk in project management. Poor cost estimates make it difficult to control costs and therefore control cost overruns (Waithera & Susan, 2017). Jennings (2012) mentioned also this claim in the study of cost overruns for the London Olympic Games. Cost estimates establish the base-line of costs for each of the stages of the project (Teye Buertey et al., 2012).

Notwithstanding management competencies and financial capability of the contractor, cost estimation is paramount for the mitigation of cost overruns. The inability of the contractor to estimate costs and the consequent inaccuracy of the tender prices are uncontrollable risks which lead to cost overruns (Doloi, 2012). In some instances, contractors abandon the project because they realise that they cannot complete the project within the budget (Waithera & Susan, 2017).

In the majority of cases projects are faced with a number of uncertainties which require assumptions to be made. Assumptions normally lead to project costs overruns (Teye Buertey et al., 2012). When the reality settles, a lot of adjustments have to be made in the budget to take into account events that were not known during the budget estimate (Flyvbjerg, 2006).

Giezen et al. (2013) talk about optimism bias and misalignment to strategy as other factors which contribute to poor cost estimates. Giezen et al. (2013) mention further, that over-optimism is one of the biggest challenges when it comes to cost estimation. Project managers might be over-confident about the project budget. They ignore risks and past lessons from previous projects. They prefer to think that their projects are not like others which have failed. Love et al. (2016) concur with this argument. They stress that project

managers do not take uncertainties into account during the calculation of the project cost estimate (Love et al., 2016). Most studies agree that failure to assess risks during the budgeting process may lead to incorrect cost estimates (Xenidis & Stavrakas, 2013). This is because the project budget is based on assumptions and uncertainties (Xenidis & Stavrakas, 2013). It is therefore important to take risk events into account when developing the budget.

The greatest cause of cost underestimate is uncertainty (Brüggen and Luft, 2015). According to Waithera and Susan (2017) the reason for underestimation is the temptation to make the project more viable to increase the chances of getting approval. Sometimes managers are incentivised for getting their projects approved and this creates the problem of deliberate cost understatement (Brüggen & Luft, 2015).

Flyvbjerg et al. (2018) argue that the best way to improve project cost estimation it is to use reference class forecasting. This approach takes lessons from similar projects which were done in the past and uses these to estimate the cost and duration of completing a similar new project. The following are three steps for reference class forecasting (Flyvbjerg et al., 2018):

- Identification of similar past projects to be included in the reference class forecasting;
- Establishment of the probability of distribution using reliable historic data; and
- Comparing the new project with the reference class distribution in order to determine the results.

Ahiaga-Dagbui et al. (2017) argue that there is still no evidence that the problem of poor cost estimation will be resolved by reference class forecasting. Flyvbjerg et al. (2018) state that, in order for the reference class forecasting to work, an incentive must be established for the project team to remain within budget. Flyvbjerg et al. (2018) also state that a project team

must be employed with a good track record and experience with the type of project being undertaken.

According to Abd El-Karim et al. (2017) projects are complex in nature. Costing and scheduling should therefore be flexible to allow changes to be made without negatively impacting the overall budget and duration. Changes are bound to happen during the project life cycle (Abd El-Karim et al., 2017).

### 2.6.1 Project contingency

A contingency is defined as a “reserve budget for coping with risks and uncertainties and to help keep the projects on budget” (Touran & Lui, 2015, p. 574). Projects are subject to uncertainties and therefore the budget has to cater for them (Touran & Lui, 2015). Insufficient contingency is a contributing factor to cost overruns (Touran & Lui, 2015). Due to the fact that estimated project costs and schedule may change due to uncertainties and unknown events, the contingency value for both cost and time should be determined (Abd El-Karim et al., 2017). Karlsen and Lereim (2005) mention that risks are bound to materialise in engineering projects and therefore there will always be costs associated with them which will require contingencies.

The important question to answer is how much contingency value should be provided for in a project? According to Teye Buertey et al. (2012) the process of determining a project contingency is not well defined and it lacks a framework. In most cases the calculation of the project contingency is not scientific, it involves a lot of thumb sucking (Teye Buertey et al., 2012). Due to the complexity and subjectivity of estimating project costs contingencies, most organisations provide 10% of the total project budget as a contingency as a rule of thumb (Teye Buertey et al., 2012). Karlsen and Lereim (2005) argue that the practice of determining the contingency based on a gut feeling, intuition or experience is not effective, it is simplistic and it leads to cost escalations. They found that a majority of project managers use a deterministic approach to calculate the cost contingency. This method may also lead to double counting because the budget is arrived at after providing

for some level of uncertainty. As a rule of thumb the percentage of the contingency amount allocated to the design phase is much higher than the one allocated for the execution phase (Love et al., 2012).

Although contingencies are determined during the planning stage, due to the fact that the budget is full of uncertainties, the contingency amount may well not be sufficient (Brüggen & Luft, 2015). According to Xenidis and Stavrakas (2012) the budget for infrastructure projects is often set up in a traditional way that fails to take into account the project uncertainties and inherent risks.

Teye Buertey et al. (2012) suggest that the project cost contingency amount should be informed by a proper risk assessment process to identify all risks and uncertainties which could result in cost escalation. The risk identification process should be performed with input from experts and capable individuals who will be able to identify uncertainties which must be taken into account during the determination of the budget (Teye Buertey et al., 2012). It is difficult to estimate the cost contingency for complex projects (Touran & Liu, 2015). According to Xenidis and Stavrakas (2012), a Monte Carlo simulation tool may be used to estimate the contingency amount. Xenidis and Stavrakas (2012) explain that the Monte Carlo simulation model simulates a large number of probable outcomes. The benefit of this method is that it quantifies risks in the form of a probabilistic distribution (Xenidis and Stavrakas, 2012).

Waithera & Susan (2017) caution that there is a misconception in the project community that the project contingency can be used for scope increases. This practice is not justified. Project cost contingencies are meant to cover items that were not identified during project planning because of uncertainties or unknowns (Waithera & Susan, 2017). The misuse of project cost contingencies leads to cost management problems and consequently cost overruns (Waithera & Susan, 2017).

## 2.7. Risk Management

Project risk management is a methodical process of identifying, analysing, responding to and monitoring risks within a project (Hashemi et al., 2013). The risk management process in projects is directly linked to the determination of a project budget as discussed in Section 2.6. Risks are events which may or may not occur within a project and, which can have either a negative or positive effect on the project achieving its objectives (Zhao et al., 2014). It has been widely accepted that the risk management process is crucial in project management for the success of a project (Zhao et al., 2014). Risk management has a crucial role in the management of projects as it involves planning, identifying, analysing, developing risk management strategies and monitoring and controlling (Kikwasi, 2012). Since projects vary in complexity and have different characteristics, there is no single risk management process which provides the best framework to manage risks in a project (Teye Buertey et al., 2012).

Mills (2000 in Zhao et al., 2014) reveals that poor project risk management results in project failure, project cost overruns, which sometimes run into billions of US Dollars. The study identifies the following causes (amongst others) which are responsible for poor project risk management: (1) Lack of information and knowledge by the appointed contractor; (2) Inadequate time and funds; and (3) Insufficient expertise and skills in risk management. Another challenge which was highlighted by Zhao et al. (2014) was that there are very few firms that offer training on project risk management.

Kikwasi (2012) identifies the following factors of risks in projects: (1) Scope management; (2) Design errors and exclusions; (3) Poorly defined roles and responsibilities; (4) Door project management skills; (5) Force majeur; and (6) new technology. Zou et al., 2006 (in Kikwasi, 2012) identifies the following significant risks for projects: unrealistic project schedule; design changes; delays in the approval processes and procedures especially in government entities and variations requested by the client and so forth.

Zhao et al. (2014) highlighted the benefits for the risk management process in projects, in the study titled “Construction Project Risk Management in Singapore: Resources, Effectiveness, Impact, and Understanding”.

- The formulation of realistic project plans;
- The determination of risk-based contingencies which remove unnecessary contingencies;
- The ability to ensure that projects to be completed within schedule and budget;
- The development of different scenarios with different impacts;
- Risk quantification and so forth.

Ali (2000) concludes that the estimation of costs using risk analysis method is superior to the traditional risk management method. The utilisation of the Monte-Carlo simulation during project risk assessment in modelling project costs and schedule can produce fairly accurate and realistic results.

## 2.8. Scope management

One of the other questions which this study aims to answer is whether poor scope definition resulted in cost overruns in TPT. Poor project scope definition is a contributing factor to project failures and cost overruns (Mirza et al., 2013). There are many factors which are responsible for cost overruns. One of them is additions to the original scope of work (Waithera & Susan, 2017). Poorly defined scope of work causes both scope creep and cost overruns (Farok & Garcia 2016). Vagueness in the scope of work leads to project cost overruns (Doloi, 2012). The scope of work should be well-defined and established as accurately as possible as it informs the amount of resources and time expected to finish the project (Newton, 2015).

There is a connection between the project schedule, scope of work and project environment (Alinaitwe et al., 2013). Alterations to any one of these factors has an impact on the costs of the project (Alinaitwe et al., 2013). Scope changes may be inevitable, especially on equipment refurbishment (brownfield) projects. Some of the problems are only revealed when the

equipment is stripped open. The scope of the project should therefore be defined by knowledgeable experts in the area to prevent unnecessary changes (Mhlanga and Mavetera, 2016). One of the mitigations for scope changes is to apply lessons learnt from previous similar projects (Yap et al., 2017).

According to Farok and Garcia (2016) project management plans are almost certain to change before the completion of the project. The sooner the changes are identified, the lesser the impact on the budget (Yap et al., 2017). It is important for all the relevant stakeholders to sign off the scope of work so that gaps can be identified as early as possible and corrected before it is too late.

Daheshpour and Herbert (2018) argue that a lack of professional experience and competence from the contractor are some of the factors which hinder the development of the scope of work. This further increases the workload, reduces the allocated project time and increases design errors and omissions (Daheshpour & Herbert, 2018). The overall impact of these factors is cost overruns. Flyvbjerg et al. (2018) mention that the main factor that causes cost overruns is human over-optimism or bias. The consequences are scope changes and ultimately cost overruns (Flyvbjerg et al., 2018).

Lee (2008) argues that some of the reasons for the changes in scope of work for port related projects are increase in capacity, lack of planning and lack of feasibility studies. Despite these shortcomings, the projects get approved due to political interests.

Farok and Garcia (2016) argue that it is publicly acknowledged in the research that there is a difference between scope creep and scope change. Scope creep is unofficial changes applied to the scope of work whilst scope change consists of unforeseen authorised changes (Farok & Garcia, 2016). Scope creep is growth in project deliverables without a corresponding increase in project resources or timelines (Abbasi et al., 2014). Scope creep is the most prominent leading cause of project failure world-wide (Farok &

Garcia, 2016). Most megaprojects usually experience scope creep (Farok & Garcia, 2016). In many instances scope creep leads to cost overruns and project schedule delays (Farok & Garcia, 2016). Scope creep is not easy to mitigate and remains a challenge for even experts with a lot of experience in the field of project management (Farok & Garcia, 2016).

According to Al-Rubaiei (2018) in order to properly address the challenges of the project scope of work, the following steps need to be implemented: planning of the scope; list the scope requirements; define and develop the scope of work; create work breakdown structure for the project; confirm the project scope and control and manage it.

Newton (2015) states that the prevention of scope creep is one crucial factor that the project manager should strive to implement. Adding expenses and processes that were not originally planned can be costly. Flyvbjerg et al. (2018) conclude that the solution to overcome cost overruns is to use reference class forecasting so that lessons learnt from past projects of a similar class are used to determine the scope of work.

## 2.9. Design changes

Yap et al. (2017) argue that in recent years, design changes have been a notable cause of project cost overruns. A study of 200 peer-reviewed articles across the world concluded that the major cause of project cost overruns is design changes (Habibi et al., 2018). According to Cox et al. (1999), even successful projects incur project cost overruns related to design changes post contract award. The following causes were common for design changes: design oversights in tender documents; alterations in requirements by employer; and new information on the existing site condition. Design changes result in to reworks which in turn increases cost overruns (Yap et al., 2017).

Yap et al. (2017, p. 1258) identified five factors which are responsible for design changes in the study titled “Collaborative model: Managing design changes with reusable project experiences through project learning and effective communication”:

- “Client related: Change of requirements; cost savings initiatives, misunderstanding of client’s brief, omissions on scope of work, add on features, new technology, slow decision making and so forth.
- Consultant related: Poor understanding of client’s needs, insufficient investigations prior to design, discrepancies in design, incomplete drawings, outdated designs, current design too expensive, impractical design, non-compliance with regulatory requirements and so forth.
- Contractor related: Schedule acceleration, to suit sub-contractor’s requirements, ease of construction, quality/rework, supplier’s technical problems, skills shortages and so forth.
- Site related: Unknown/unforeseen site conditions, site safety consideration, undetected underground services, and clashes with adjacent structures.
- External related: Changes in Laws and Regulations, permits, changes in decision making authority and so forth”.

## 2.10. Project approval process

Another question to be answered by this study is whether project approval delays contribute to cost overruns in TPT. According to Kagiri and Wainaina (2017), in their study of cost overruns in power projects for Kenya, bureaucracy in the procurement process was ranked as a leading cause for project costs overrun. This is common in government entities where all the boxes have to be ticked before a project is given approval (Kagiri and Wainaina, 2017). In many instances the people entrusted with delegation of authority are too cautious to the detriment of the project progress (Kagiri and Wainaina, 2017). Doloi (2012) and Mulla and Waghmare (2015) identify slow decision making processes as one the key contributors to project cost overruns.

## 2.11. Project management resources

Project management resources are very important for the successful delivery of projects. Poor project management resources could severely impact the project and result in cost overruns. In general, there is a shortage of project management resources in the world. It is therefore important to employ a team of competent project managers and to support it with ongoing training (Waithera & Susan, 2017).

According to Gernetzky (2019), Sasol's board of directors found that some of the causes for the cost overruns at the Lake Charles Chemicals Project was that the project team lacked competency and they were not transparent.

## 2.12. Conclusion

This chapter is structured as follows: (1) Introduction, (2) the extent of project cost overruns, (3) the project life cycle process, (4) definition and measurement of project cost overruns, (5) causes of cost overruns, (6) project cost estimates, (7) project contingency, (8) risk management, (9) scope management, (10) design changes, (11) project approval process, (12) project management resources, and (13) conclusions.

Cost overruns is a problem facing many organisations and SOEs world-wide and, despite research that has been done, it remains a complex challenge. Cost overruns tend to affect Governments the most, because of the size of their infrastructure projects and budget. The impact of cost overruns can be huge on the economy and the tax payers.

Literature provides different methods of calculating cost overruns. A simple calculation is to compare the original approved budget amount with the final project completion costs. In the literature, however, it does appear that the initial budget may not be realistic for complex projects. However, if management wants to measure the effectiveness of their decision making process, they can use the simple method of calculating cost overruns. The literature makes a provision for another method of calculating cost overruns,

where the final budget at the detailed planning stage is compared to the actual final project completion cost.

There are various factors which give rise to cost overruns. The following is a summary of prominent factors from the literature review:

- Incorrect cost estimates, which often are caused by bias, over optimism from project managers and inadequate risk assessments;
- Poor scope of work;
- Poor technical designs and specifications;
- Lack of experience and skills in managing big and complex projects;
- Project approval delays by various regulatory bodies;
- Slow decision making by management;
- Incompetent contractors;
- Awarding bids to cheapest bids who deliberately underquote;
- Failure to observe site conditions;
- Failure to consider new technology;
- Poor documentation and so forth.

The next chapter will discuss the research methodology that will be used to do the study.

# CHAPTER THREE
# RESEARCH METHODOLOGY

## 3.1. Introduction

This chapter aims to discuss the methodology used to conduct the research. In the previous chapter the literature review covered a global perspective of the factors which negatively affect project cost overruns e.g. poor project scope definition, poor cost estimates including the project contingency, long project approval process, design changes, poor risk management process and so forth. The findings of the literature review will be used to form a framework for this study.

This chapter is structured as follows: (1) Section 3.2 deliberates on the need for the study and study aims; (2) Section 3.3 deliberates on the different types of research methods; (3) Section 3.4 gives justification for the research method employed; (4) Section 3.5 discusses the various data collection strategies; (5) Section 3.6 deliberates on data analysis; (6) Section 3.7 discusses data trustworthiness, which is also known as validity and reliability; (7) Section 3.8 discusses ethical issues and (8) Section 3.9 is the conclusion on the chapter.

## 3.2. Need for the study and research aims

This study aims to have an appreciation and insight of the causes of project cost overruns in TPT. The researcher is not aware of any other study of this nature for TPT. The findings of this study will benefit TPT to overcome the challenges of cost overruns. This is even more important at this time as TPT is facing pressure from shipping lines due to port inefficiencies. The aims of the study are to:

- To quantify the total Transnet Port Terminals project cost overruns for the financial years: 2015/16 to 2018/19; and
- To identify and analyse the causes of cost overruns for Transnet Port Terminals for the financial years: 2015/16 to 2018/19.

### 3.3. Research methods

It is imperative that the researcher selects an appropriate research method which will lead to a solution for the problem or the discovery of new information. This Section discusses the research method employed and the reasons for using them. The definition of research is “a systematic study to find facts or principles or to gather information on a subject or topic” (Free Dictionary, 2012:1). Methodology is defined as “a body or a system of rules or principles used in a particular discipline” (Free Dictionary, 2012:1). The researcher should be able to have insight about the problem and be in a position to recommend practical solutions.

According to Sekeran and Bougie (2014) research is broadly categorised into three different types i.e. qualitative, quantitative and mixed methods. According to Babbie and Mouton (2007) qualitative research involves interpretivism. The researcher engages experts in the field of the problematic area to collect perspectives and uses them to create themes to analyse and understand the problem (Babbie and Mouton, 2007).

Quantitative research on the other hand is structured around the positivist framework as the researcher uses a scientific approach to analyse data and to arrive at results and conclusions (Sekeran and Bougie, 2014). It is widely accepted to use a mixed method which is a hybrid of the quantitative and qualitative methods (Denscombe, 2009).

According to Gumede (2012) quantitative and qualitative research methods are different. In the quantitative method the hypothesis is explicitly formulated and stated. The measures are systematically and logically created, standardised prior to the collection of data, and data is in the form of numbers (Gumede, 2012). However, in the qualitative method, the hypothesis is itemised in the procedure of the research, measures are not created in a systematic way but they are created in a casual manner, and data is in the form of themes (Gumede, 2012).

### 3.4. Research method employed

This study uses the mixed method. The study uses a thematic data analysis approach to code qualitative data and develop it into themes which are used to present the results and findings. Leedy and Ormrod (2014) suggest that qualitative research is appropriate for studies with rich description and detailed understanding. The main reasons for selecting the mixed research method is because some of the data collected is in text format i.e. business cases, minutes and interviews with the study participants and the other data is in numbers i.e. the analysis and quantification of cost overruns from the TPT Projects Repository (2019). Denscombe (2010) suggests that the mixed method is appropriate when data analysis uses both qualitative and quantitative analysis.

A challenge with qualitative research is that the results could be biased because of a lack of scientific analysis. There are other factors which may contribute to bias e.g. unrepresentative population, inappropriate data collection mechanism. In order to overcome this challenge, the triangulation data analysis method is used. Triangulation is a method of collecting data from various independent sources to ensure that there is no bias in the study (Denzin, 1989). Babbie and Mouton (2007) suggest that triangulation is a better method to mitigate the risk of bias in qualitative studies. Triangulation in this study is achieved by obtaining data from the following sources: (1) existing TPT Projects Repository (2019), (2) business cases, CAPIC minutes and resolutions and (3) interviewing knowledgeable managers in TPT. The data obtained from these three data sources was compared in order to achieve triangulation.

### 3.5 Data Collection

The primary and secondary data is collected and used for the study. Primary data consists of interviews with knowledgeable managers who are specialists and experts occupying various positions in TPT and secondary data is in the form of values and text from the TPT Projects Repository (2019), business case submissions, minutes and resolutions of CAPIC.

### 3.5.1 List of Interviewees

Interviews were conducted on a one on one basis with the interviewees. This approach was preferred in order to get first hand and reliable information. It also allowed for clarity questions to be asked by the researcher during the interview session. Appointment with the participants were done telephonically followed by meeting invites using the Outlook Email System. Interview questions were developed by the researcher with an aim of identifying underlying root causes of project cost overruns in TPT. The interview questions were emailed to each participant well in advance in order to give them sufficient time to prepare for the interview. The interviews were about 20 minutes long depending on the length of the discussion. The participants were given liberty to express themselves the way they wanted and to use practical examples to support their arguments. The interview process helped to gather sufficient data about why projects tend to exceed the original approved budget. The interview process also allowed the researcher to identify key themes.

The following is a list of interview questions which the participants were asked to answer about areas which may give insight about the causes of cost overruns in TPT:

- Do projects have clear scope definition?
- Is the duration of the project approval process reasonable?
- Are project cost estimates including contingencies reasonable?
- Which causes have a significant impact on cost overruns?
- Can the causes be prevented?

### 3.5.2 Sampling method

In order for a study to be effective, it is imperative to identify a population and draw a representative sample upon which conclusions will be made (Sekeran and Bougie, 2009). The population relates to all the items in the study and each item is referred to as an element. A sample is a unit of analysis selected from the population. A purposive sample was employed to select the interviewee to participate in the study. Purposive sampling is a technique which is used when one targets a particular group in the population which is

knowledgeable about the hypothesis (Welman et al., 2005). A researcher may use a purposive sample to select participants of choice if he believes that it is economical to do so and if they have the necessary experience (Welman et al., 2005). The participants in the study were carefully selected to ensure that various perspectives are obtained from people who have different expertise and extensive knowledge about the topic of project management and cost overruns. The participants were a mix of skills from the following portfolios at TPT: Projects Management, Engineering, Finance, and Business Case Writing. Fifteen participants in all were selected for the study and they were all interviewed.

Table 3.2 indicates the demographics of the interviewees, their gender, the positions which they occupy in TPT and the dates when they were interviewed.

Table 3.2: Description of the study participants

| Respondent | Gender | Position at TPT | Date |
|---|---|---|---|
| R1 | Male | Programme Manager | 18 June 2019 |
| R2 | Male | Programme Manager | 15 August 2019 |
| R3 | Male | Senior Project Manager | 21 June 2019 |
| R4 | Male | Senior Project Manager | 22 August 2019 |
| R5 | Male | Project Manager | 9 July 2019 |
| R6 | Male | Project Manager | 8 August 2019 |
| R7 | Female | Project Manager | 8 August 2019 |
| R8 | Male | Project Manager | 9 July 2019 |
| R9 | Male | Project Manager | 20 August 2019 |
| R10 | Male | Project Planner | 16 July 2019 |
| R11 | Female | Divisional Financial Planner | 18 June 2019 |
| R12 | Male | Business Case Manager | 19 June 2019 |
| R13 | Male | Financial Manager | 8 August 2019 |
| R14 | Male | Chief Engineer | 12 August 2019 |
| R15 | Male | Executive Manager: | 23 August 2019 |

| Respondent | Gender | Position at TPT | Date |
|---|---|---|---|
| | | Management Information Systems (Ex – Head of business case writing) | |

### 3.5.3 Secondary Data Collection and Analysis

Secondary data was collected from the existing TPT Projects Repository (2019) maintained by the TPT Capital Projects Department, business cases, minutes and resolutions of CAPIC. There is a dedicated administrator who maintains the TPT Projects Repository (2019) by creating project folders and uploading relevant documents for each project in the relevant folder. The risk of bias in the data selection was mitigated by selecting all projects (this is the entire population) with cost overruns uploaded onto the TPT Projects Repository (2019) for the period under review (2015/16 FY to 2018/19 FY). This was possible because the folders in the TPT Projects Repository (2019) are categorised according to the financial years.

## 3.6 Data Analysis

Thematic analysis is a method used to analyse data in qualitative research by developing themes. This method allows creativity of the researcher to tell the story line (Vaismoradi et al., 2016). According to Braun and Clarke (2016: pp.77-101), “thematic analysis is a method for identifying, analysing, and reporting patterns (themes) within data”. Braun and Clarke (2016) conclude that the thematic method allows searching the entire data set primary or secondary to find frequent patterns of meaning. Vaismoradi et al. (2016) go on further to describe a theme as a key product of data analysis that gives pragmatic results in a specific area of study.

It has been widely accepted in literature that the development of themes is challenging, it remains unclear and the available literature that gives guidance on the steps used to identify themes is insufficient (Vaismoradi et al., 2016). This is because theme identification involves intuition and therefore, it is

subjective. The following method or steps may be used to identify meaningful themes: getting familiar with data content, coding, scanning the data for appropriate themes, reviewing the themes and relating them to the data (Vaismoradi et al., 2016).

In qualitative research methodology, data analysis can be done at the same time or in parallel with data collection. The researcher is allowed to start early to identify trends, patterns and themes. After each interview the researcher went through the data collected and organised it into manageable units. The researcher did follow this method to analyse data.

The following process was used to arrange data for analysis from the TPT Projects Repository (2019), business cases, minutes and CAPIC resolutions:

- The TPT Projects Repository (2019) contains a list of approved projects. It is structured in layers of folders which are categorised first, in terms of relevant financial years, location or terminal, then list of projects for the terminal including the description of the project and then different subfolders which contains various project documents e.g. motivations for cost overruns, business cases, scope of work and so forth. The details of the projects with cost overruns were extracted manually from the TPT Projects Repository (2019) and recorded on Microsoft Excel Spreadsheets to allow the researcher to quantify cost overruns and to produce various graphs and trends.
- The extracted information from the TPT Projects Repository (2019) was validated against the minutes and resolutions of CAPIC where cost overruns and budgets for each project were approved. The minutes and resolutions are kept safely in PDF format by the Secretary of CAPIC. Therefore, the data from the TPT Projects Repository (2019) reconciles to the CAPIC minutes and resolutions for completeness and validity.

## 3.7 Validity and reliability

In order to minimise the possibility of biased results and subjectivity a triangulation method is used. Triangulation is a method of obtaining data collection from different sources to make an argument. Barbie and Mouton (2007) argue that triangulation can be used to eliminate subjectivity in a research study. For this study triangulation will be achieved by comparing data gathered from the literature review, interviews with study participants and business cases from the TPT Projects Repository (2019) and minutes and resolutions of CAPIC. Elo et al. (2014) Use the term trustworthiness, to argue that validity of data can be achieved in qualitative studies. They mention that the results of trustworthiness depend on the availability of rich, appropriate and well saturated data (Elo et al., 2014). In addition, the trustworthiness of data can be verified by providing precise details of the data analysis and sampling used (Elo et al., 2014).

The study participants are independent, well experienced and come from various fields within TPT. This on its own ensures that bias is eliminated to a certain extent. The secondary data collected from the TPT Projects Repository (2019), business cases and minutes which contain motivations and reasons for project cost overruns is widely available within TPT and it represents true discussions that transpired during CAPIC meetings. Based on the explanations above the data used in the study is trustworthy, valid and reliable.

## 3.8 Ethical consideration

All ethical and compliance issues were taken care of in this study. A Gate Keepers Letter was obtained from TPT allowing the researcher to have access to data. An Ethical Clearance certificate was obtained from the University of Kwa-Zulu Natal's Ethics Committee before the study was undertaken. Each participant was requested to sign the informed consent letter allowing the researcher to conduct interviews.

## 3.9 Conclusion

The purpose of this chapter was to look at the different types of research methods, the research method employed for the study and the justification thereof, data collection strategies and data analysis techniques that will be used to diagnose the problem. In addition, the chapter demonstrates how triangulation is achieved by explaining the different data sources i.e. TPT Projects Repository (2019), business cases, CAPIC minutes and resolutions and interviews with experienced managers in TPT. Details about the TPT Projects Repository (2019) are given including discussion about data validity and reliability.

This study employs the mixed method to analyse data due to the fact that the data is in both text format and in numbers. The study uses the thematic approach to analyse data and uses descriptive statistics and themes to present the findings.

The next chapter discusses data analysis from the primary and secondary data sources i.e. TPT Projects Repository (2019), business cases, minutes and resolutions of CAPIC and interview results from study participants. The findings are presented in themes which explain the causes of cost overruns in TPT.

# CHAPTER FOUR
# ANALYSIS AND PRESENTATION OF DATA ON COST OVERRUNS AT TPT

## 4.1. Introduction

The preceding chapter looked at the design methodology for the study, data collection process and analysis. This chapter presents the analysis of the data from the TPT Projects Repository (2019), business cases, minutes and resolutions of CAPIC and the perceptions obtained from the study participants through interviews. A thematic data analysis method is used to develop themes which are used to categorise and analyse data.

The following is a brief summary of the process for the approval of increase in estimated total project costs in TPT. For the purpose of this study an increase in estimated total project costs is called “cost overruns”. The process starts with a business case submission to the TPT Investment Forum. The business case contains amongst other things, the description of the project, the project need, history of project events and activities and a motivation for the cost overruns. Once the Investment Forum is satisfied with the business case submission and the reasons for the cost overruns, it recommends the business case submission to CAPIC for approval. CAPIC comprises of General and Executive Managers from various departments. They scrutinise the business case to establish whether there are valid grounds for the overruns. Once CAPIC is satisfied with the business case submission, they approve the cost overruns. The Capital Projects Department maintains a TPT Projects Repository (2019), where documents for approved projects are filed e.g. business cases and so forth. Access to the TPT Projects Repository (2019) is controlled by user names and passwords in order to ensure that the data integrity is not compromised. The details of the TPT Projects Repository have been provided in Section 3.6.

## 4.2. Summary of data from the TPT Projects Repository (2019)

The data from the TPT Projects Repository (2019) was extracted manually into Microsoft Excel spreadsheet, analysed to identify the number of projects with cost overruns and to quantify the cost overrun per financial year as presented in figure 4.1.

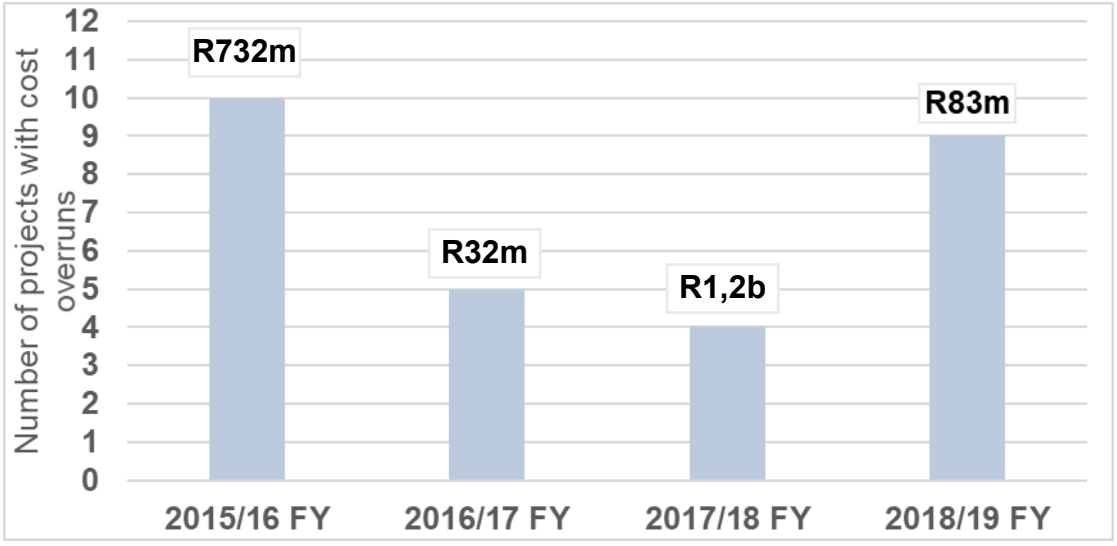


Figure 4.1 Project cost overruns per financial year
Source: Author compiled and collated from the TPT Projects Repository: 2019.

As can be seen from figure 4.1, there were 10 projects with cost overruns for the 2015/16 FY, amounting to R732 million, five during the 2016/17 FY amounting to R32 million, four during the 2017/18 FY amounting to R1,2 billion and nine during the 2018/19 FY amounting to R83 million. There were three projects with total cost overruns of R8m which were incurred prior to the 2015/16 FY. A project could have multiple cost overruns spanning over different financial years. Refer to Table 4.1, for illustration and the notes provided.

**Table 4.1 TPT Project Cost Overruns Per Financial Year**

| # | Project Description | TPT Project Cost Overruns Per Financial Year | | | | |
|---|---|---|---|---|---|---|
| | | 2015/16 FY R | 2016/17 FY R | 2017/18 FY R | 2018/19 FY R | Notes |
| 1. | DBN Car Terminal Inspection Facility (2015/16 FY) | 1 509 543 | - | - | - | - |
| 2. | Resurfacing of the Mechanical Handling Appliance Facility at Durban MPT (2015/16 FY) | 4 393 436 | - | - | - | - |
| 3. | Fire Detection and Suppression System for Substations at SLD IOT (2015/16 FY) | 636 711 | - | - | - | a |
| 4. | Upgrade of Security Lighting at SLD (2015/16 FY) | 218 588 | - | - | - | - |
| 5. | Safety Critical Work for East London Grain Elevator (2015/16 FY) | 10 783 066 | 15 824 117 | - | - | - |
| 6. | Fire Deluge System SLD IOT (2015/16 FY) | 2 431 350 | - | - | - | b |
| 7. | Refurbishment and Upgrade of the Admin building at SLD IOT (2015/16 FY) | 231 087 | - | - | - | c |
| 8. | Refurbishment of Conveyor Belt Moving Heads for Richards Bay Terminal (2015/16 FY) | - | 3 16 6116 | - | - | - |
| 9. | Phase 1 of the Port Elizabeth MPT Safety Critical Works (2015/16 FY) | 6 843 005 | 2 593 154 | - | - | - |
| 10. | Acquisition of Hazmat Trailers (2016/17 FY) | - | 1 429 417 | - | - | - |
| 11. | Construction of the Warehouse in SLD MPT (2016/17 FY) | - | 8 861 865 | - | 10 436 231 | - |
| 12. | Storm & Environmental Systems at SLD IOT (2017/18 FY) | - | - | 5 300 614 | - | - |

| # | Project Description | TPT Project Cost Overruns Per Financial Year | | | | |
|---|---|---|---|---|---|---|
| | | 2015/16 FY R | 2016/17 FY R | 2017/18 FY R | 2018/19 FY R | Notes |
| 13. | Upgrade of Caillard Machines for RCB Terminal (2017/18) | - | - | 59 107 876 | 30 860 045 | - |
| 14. | Time and Attendance System for CTCT (2015/16 FY) | 2 727 268 | - | - | - | - |
| 15. | Conveyor Belt Washing Systems at SLD IOT (2017/18 FY) | - | - | 299 945 | 2 231 488 | - |
| 16. | Upgrade of Slip Rings at RCB Terminal (2018/19) | - | - | - | 594 572 | - |
| 17. | Upgrade of the Electrical Substation at Durban AGRI Port (2018/19 FY) | - | - | - | 1 111 917 | - |
| 18. | Refurbishment of Hoppers at RCB Terminal (2018/19 FY) | - | - | - | 7 831 768 | - |
| 19. | Replacement of Elevator at SLD Terminal (2018/19 FY) | - | - | - | 743 754 | - |
| 20. | Refurbishment of Ship Loader at Durban AGRI Port Terminal (2018/19 FY) | - | - | - | 28 638 727 | - |
| 21. | Electronic Invoicing System (2018/19 FY) | - | - | - | 576 250 | - |
| 22. | Construction of the 3rd Tippler for SLD IOT (2015/16 FY) | 702 475 513 | - | 1 172 590 227 | | - |
| **Grand Total** | | **732 249 567** | **31 874 669** | **1 237 298 662** | **83 024 752** | **-** |

Source: Author compiled and collated from the TPT Projects Repository (2019)

Notes:

a: There were cost overruns to the amount of R1 041 872 incurred during the 2012/13 FY.

b: There were cost overruns to the amount of R6 462 335 incurred during the 2013/14 FY.

c: There were cost overruns to the amount of R496 508 incurred during the 2014/15 FY.

Figure 4.2. presents cost overruns per type of project for the period under review.

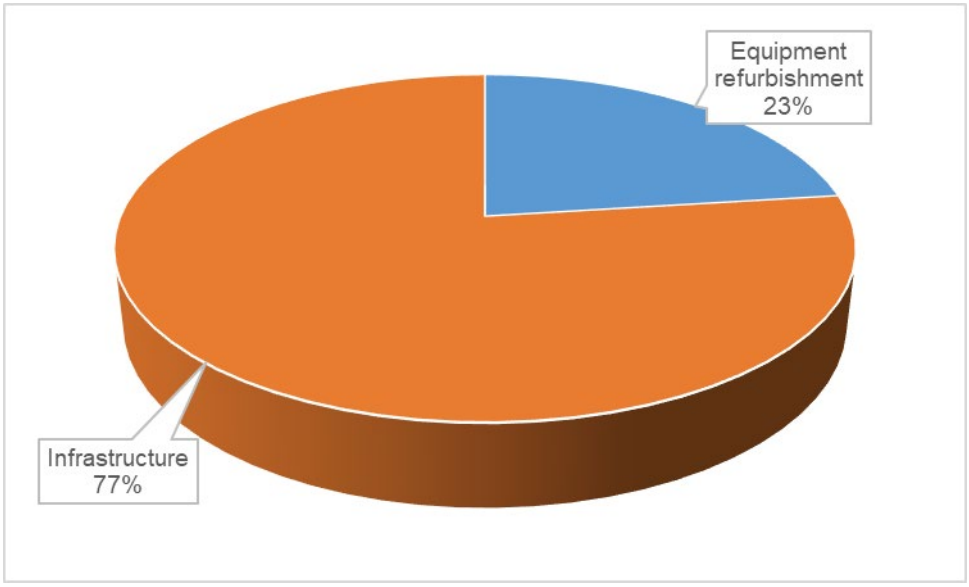


Figure 4.2 Types of projects with cost overruns for the financial period, 2015/16 FY to 2018/19 FY

Source: Author compiled and generated from the TPT's Projects Repository: 2019

As per Figure 4.2, cost overruns are prevalent in infrastructure projects (77%), followed by equipment refurbishment (23%). There were no cost overruns for new equipment acquisition.

Figure 4.3, presents the causes of project cost overruns recorded on the business cases motivating for increases in project budgets for the financial years under review.

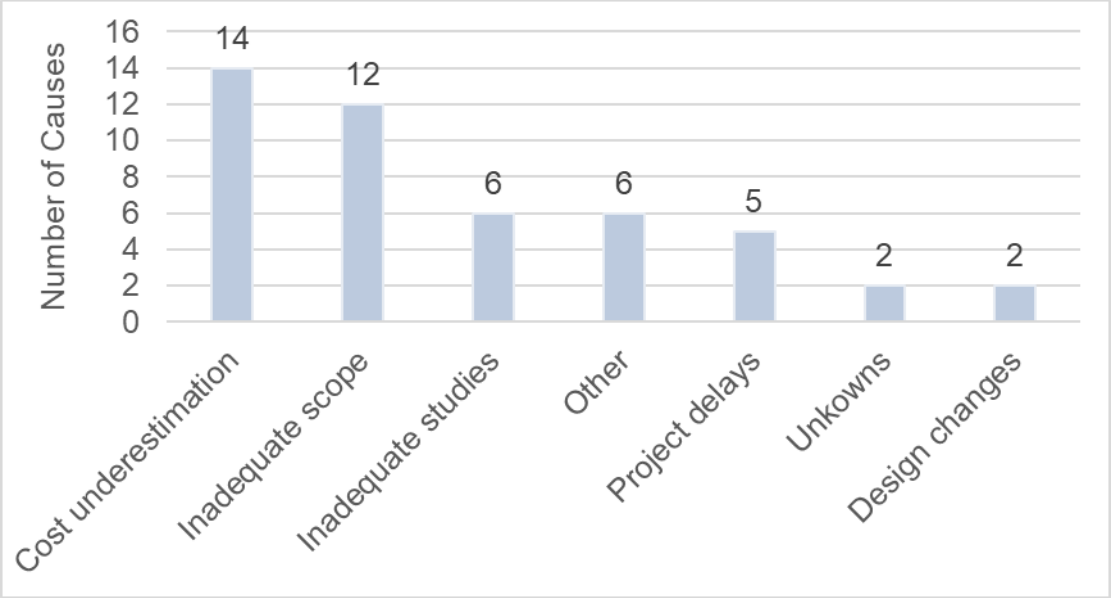


Figure 4.3 Causes of project cost overruns, 2015/16 FY to 2018/19 FY
Source: Author compiled and collated from the TPT Projects Repository: 2019

From figure 4.3, there were 14 causes related to under estimation of the project costs; 12 causes related to inadequate scope of work; six causes related to inadequate engineering studies; six causes related to a variety of other causes e.g. lack of drawings; changes in strategy and so forth; five causes related to project delays; two causes related to unknown site conditions; and two causes related to design changes. One business case requesting for an increase in budget could have a mix of causes. Themes were identified from the business cases and are presented in Section 4.3. below.

### 4.3. Analysis of themes from business cases

Six themes below were extracted from the 22 business cases motivating for project cost overruns. The causes presented in Figure 4.3 were coded into different themes. One business case could have more than one theme depending on the number of issues identified. The themes are discussed below.

- Inadequate engineering studies;
- Lack of project management skills;
- Procurement delays;
- Poor maintenance practices;
- Poor scope definition; and
- Over-regulation.

#### 4.3.1. Inadequate engineering studies

Some business cases motivating for project cost overruns cited the lack of engineering studies as one of the underlying causes for cost overruns. Below are the examples.

- Construction of the 3rd Tippler for SLD IOT (2015/16 FY). The business case mentions that the budget for the project was increased from R1,58 billion in 2015/16 FY to R3,067 billion in 2017/18 FY (As illustrated in Table 4.1), mainly due to the fact that engineering studies were not adequately performed before the execution of the project. The reason why the engineering studies were inadequate is because there was urgency and pressure from management to deliver the project. The project team decided to do the engineering studies in parallel with project execution. It is mentioned in the business case that this led to premature scope of work, which kept on changing as the studies were completed. To paint the picture of how this problem affected the budget; in 2015/16 FY the project budget was increased from R1,58 billion to R2,28 billion to cater for bulk power supply which was not identified and included in the scope of work. It was mentioned in the business case that the need for the bulk power supply should have been identified in the feasibility study. The business case noted further that even though the project budget had been

increased, the were still further increases which were anticipated due to the fact that there were still other feasibility studies which were still in progress. Indeed, in the 2017/18 FY, the project budget was increased further from R2,28 billion to R3,067 billion to cater for additional requirements which were identified by the engineering studies.

It must be noted that there were other contributing factors to the cost overruns however, the lack of engineering studies was highlighted in the business case as one of the main causes. It must be mentioned also, that there was a cost optimisation process for this project to reduce the costs. The details of the cost optimisation initiatives have not been covered in this study.

- Storm and Environmental Systems at SLD IOT (2017/18 FY). The project team decided to reduce the cost of the FEL 3 study by, deferring a majority of the electrical, mechanical and process work, to the project execution phase. However, they realised at the beginning of the FEL 3 study, that this would result in inadequate scope of work. A decision was therefore made to include the work back to the scope and budget for the FEL 3 study. This resulted in the project budget being increased.

- Upgrade of the Electrical Substation at Durban AGRI Port (2018/19 FY). The budget for the project was increased from R15,3m in (2017/18 FY) to R16,4m in (2018/19 FY). The main reason for the cost overruns noted in the business case, was that there was a lack of research about the legislative requirements which were applicable to the project. The aim of the project was to upgrade the existing electrical substation which was housed in its own dedicated building. The OHS Act (1993) required the upgraded electrical substation to be housed in a much bigger building than the existing one. This requirement was identified by the contractor during the project execution phase, after the components for the upgrade of the substation had been procured and delivered. The project had to stop until the construction of the new building was completed. In addition, the project budget had to be increased for the construction of the building. The project

team noted in the business case that this gap should have been identified had sufficient research been performed prior to the execution of the project.

- Construction of the Warehouse in SLD MPT (2016/17 FY). The project budget was increased from R94,9m in (2016/17 FY) to R105,4m in (2018/19 FY) due to the fact that wrong material was used for the construction of the warehouse floor. The project team failed to conduct a proper investigation to determine suitable material to be used to construct the floor. As a results the newly constructed floor cracked after just a few months after commission, because of the pressure that was exerted by the equipment on the floor surface when scooping cargo. It was mentioned in the business case that the project team had assumed that because a similar warehouse in Richards Bay had used paving blocks for its floor, then the same material could be used for the SLD warehouse. Upon investigation it was established that the cargo and equipment for the two warehouses were different. The project team acknowledged in the business case that the reason why they did not perform adequate studies, was because they were looking for a quick solution, since they wanted to meet customer commitments. However, the shortcut costed TPT more than R10 million in cost overruns.

- Resurfacing of the Mechanical Handling Appliance Facility at Durban MPT (2015/16 FY). The project budget was increased from R31,9m to R35m in (2015/16 FY), mainly due to inadequate engineering studies. The project team noted in the business case that the study to detect underground services was not undertaken. In addition, underground water was not tested for contamination before construction. This resulted in additional funds being allocated to the budget to excavate underground cables and to dispose the contaminated underground water.

- Upgrade of Caillard Machines for RCB Terminal (2017/18). The project budget was increased twice, from R27,7m to R80,4m during the (2017/18 FY) and to R111m during the (2018/19 FY). It was mentioned in the

business case that the cost overruns were due to unforeseen worn out components which had been damaged beyond what was anticipated when the scope of work was drafted. It was not possible for the project team to assess the condition of the hidden machine components, because they would have to strip the machines, and that would have affected operations. Therefore, the condition assessment study was inadequate and it resulted in inadequate scope of work and cost overruns. In addition, some of the machine components had been phased out in the market because the machines were no longer being manufactured. This was also not identified prior to executing the project and as a result higher costs had to be paid for new components.

- DBN Car Terminal Inspection Facility (2015/16 FY). The project budget was increased by R200 000 in (2015/16 FY) to cater for geotechnical studies which had not been budgeted for. This had a knock on effect of two months' delay in the project duration.

### 4.3.2. Lack of project management skills

Another observation which was highlighted in the business cases was the lack of project management skills especially Cost Engineers and Quantity Surveyors. These skills are crucial in the calculation of bills of quantities and project cost estimation. This gap was highlighted in the business case for the Upgrade of Caillard Machines for RCB Terminal (2017/18). As explained above in Section 4.3.1, the project to the upgrade Caillard Machines for RCB Terminal experienced massive cost overruns. The project team noted in the business case that one of the reasons for such a massive increase in the estimated costs was the absence of Cost Engineers and Quantity Surveyors to assist with cost estimation.

It must be mentioned that at the time of this study, TPT had started already a procurement process to procure services of Cost Engineers and Quantity Surveyors amongst other services.

### 4.3.3. Poor maintenance regime

Another problem which was highlighted in the business case for the Upgrade of Caillard Machines for RCB Terminal (2017/18) was poor maintenance practices. The maintenance team did not properly maintain the equipment. This resulted in the deterioration of equipment to a level where components which should have been refurbished ended up being replaced. This negatively impacted the project budget. It only became apparent during the stripping of the equipment how badly damaged some of the components were. It was recommended in the business case that TPT needs to adopt the Asset Management Life Cycle in order to adequately maintain equipment. Maintenance budgets must not be reduced in order to prevent the postponment of mantainance work.

Another example of how poor maintenance practices led to cost overruns, was in the Upgrade of Slip Rings at RCB Terminal (2018/19) project. One of the reasons for the R594 572 budget increase was additional work which was not included in the original scope of work. According to the reasons given in the business case, the maintenance department failed to perform certain maintenance activities. As a result, the project budget had to cater for the shortfall in maintenance work.

### 4.3.4. Procurement delays

It was noted during the review of the business cases that procurement delays are some of the factors which have contributed to project cost overruns. This has affected projects in two ways i.e. escalation of prices and rates due to inflation and deterioration of the condition of equipment which led to adjustments in the original scope of work and the project budget. Table 4.2. shows some of the examples.

**Table: 4.2. Procurement delays**

| # | Project Name | Original budget | Revised budget | Description of delays (History of activities which led to the delays) | Total delays from date of first business case approval |
|---|---|---|---|---|---|
| 1. | Safety Critical Work for East London Grain Elevator (2015/16 FY) | R7.86 million | R30.1million | • **February 2014** - First business case approval for a budget of R7.86m.<br>• **September 2014** – Consultant appointed to compile the scope of work for the tender to go out to the market.<br>• **April 2015** - The contract is non-awarded due to bidders not complying with internal processes.<br>• **September 2015** – Second business case approval at a budget of R18.65m. The scope of the project has now been increased because the condition of the Grain Elevator has deteriorated due to time delays.<br>• **February 2016** – Another non-award of the contract tender. | **28 Months** |

| # | Project Name | Original budget | Revised budget | Description of delays (History of activities which led to the delays) | Total delays from date of first business case approval |
|---|---|---|---|---|---|
| | | | | Suitable bidders are not available in the market. The project is temporarily put on hold. The project completion time is extended by 12 months from April 2016 to April 2017.<br>• **May 2016** – Final approval is granted at a budget of R30.1m. | |
| 2. | Conveyor Belt Washing Systems at SLD IOT (2017/18 FY) | R833 758 | R3 364 192 | **May 2016** – Original business case approval at a budget of R833k.<br>**September 2016** – Non-award of the tender due to the tender bid price being higher than the approved budget.<br>**May 2017** – Approval for first increase in the project budget to cater for the difference between the bid price and the budget. The new budget was approved at R1,1m.<br>**July 2017** – Another non-award of the tender due to the fact that there was a change in the procurement strategy to restrict the tender to EMEs. As a result, the bid prices for EMEs were much more expensive than the market prices. This required the budget to be increased again.<br>**May 2018** - Approval for second increase in project budget from R1,1m to R3,3m. This is the budget that was used to go out to the market again. | **24 Months** |

| # | Project Name | Original budget | Revised budget | Description of delays (History of activities which led to the delays) | Total delays from date of first business case approval |
|---|---|---|---|---|---|
| 3. | Refurbishment of Conveyor Belt Moving Heads for Richards Bay Terminal (2015/16 FY) | R18 million | R21 million | The increase in the estimated costs was purely as a result of time delay. Rates went up because of delays and the budget had to be increased. The following events took place for the approval of the scope of work by the Bids Specification Committee:<br>• **April 2015** – Approval of the business case.<br>• **July 2015** - First submission to approve the scope of work was not approved by the Bid Specification Committee. The scope of work was to be re-written.<br>• **October 2015** - Second submission of the scope of work was also not approved due to poor technical evaluation, scope of work and so forth.<br>• **December 2015** - Third submission of the scope of work turned down again due to problems with the scoring matrix and so forth.<br>• **Jan 2016** - Fourth submission of the scope of work was approved by the Bid Specification Committee.<br>• **July 2016** – Final approval of the revised business case to approve the increase in the project budget. | **16 Months.** |

| # | Project Name | Original budget | Revised budget | Description of delays (History of activities which led to the delays) | Total delays from date of first business case approval |
|---|---|---|---|---|---|
| 4. | Acquisition of Hazmat Trailers (2016/17 FY) | R1 million | R4,7 million | The following time delays were experienced:<br>• **Jan 2014** – First approval of the project budget at R1m for SLD ITO only;<br>• **February 2014** – Additional budget of R2,2m approved for additional trailers for two other terminals, Richards Bay and East London, which were not part of the original budget.<br>• **April 2016** – Increase in budget to R4,7m approved. Reasons noted for the increase are that the hazmat trailers had to be manufactured by TE because they had the first right of refusal for the tender. However, they did not have a prototype, they had to manufacture it first before submitting a quotation. When they completed the prototype in 2016, they submitted a quotation which far exceeded the quotes which had been obtained from the market. | **27 Months** |
| 5. | Replacement of Elevator at SLD Terminal (2018/19 FY) | R1 million | R1,8 million | One of the reasons for the increase in the project budget was due to time delays in the procurement process. The following sequence of events demonstrate the delays:<br>• **October 2017** – Approval of the business case with an approved budget of R1 056 246.<br>• **January 2018** – Change in procurement strategy from confinement | **9 Months** |

| # | Project Name | Original budget | Revised budget | Description of delays (History of activities which led to the delays) | Total delays from date of first business case approval |
|---|---|---|---|---|---|
| | | | | to open market tender.<br>• **May 2018** – Invitation of bidders.<br>• **July 2018** – Approval of decision to award the tender.<br>The project team noted on the business case that as a result of the above-mentioned delays the project milestones have significantly shifted from a completion date of September 2018 to March 2019. | |
| 6. | Refurbishment of Ship Loader at Durban AGRI Port Terminal (2018/19 FY) | R12 million | R40 million | The following is a sequence of events which demonstrate delays encountered in the project:<br>• **April 2017** – The business case and the original budget of R12 128 565 was approved.<br>• **August 2017** – Presentation of the scope of work to the Bid Specification Committee for approval.<br>• **December 2017** – Offer received from the bidder.<br>• **June 2018** – Revised offer received from the bidder after lengthy negotiations.<br>• **September 2018** – Changes to the scope of work to accommodate customer's requests.<br>• **February 2019** – Presentation of revised budget to the Capital Investment Committee. | **22 Months** |

| # | Project Name | Original budget | Revised budget | Description of delays (History of activities which led to the delays) | Total delays from date of first business case approval |
|---|---|---|---|---|---|
| 7. | Time and Attendance System for CTCT (2015/16 FY) | R2,1 million | R5,6 million | • The first approval in February 2012 was for an installation of an access control system.<br>• An increase in budget was approved in December 2015 to add time and attendance requirement to the original scope of work.<br>• Another addition to the scope of work was approved in September 2017. | **68 Months** |

### 4.3.5. Over-regulation

TPT is a division of Transnet an SOE, and as such it is required to comply with various pieces of legislation governing the procurement process. TPT has to comply with the Preferential Procurement Policy Framework Act, 2000 (Act No 5. of 2000), Public Finance Management Act, 1999 (Act No 1. Of 1999), Broad-Based Black Economic Empowerment Act, various National Treasury Instructions Notes and the Transnet Procurement Procedures Manual (Transnet PPM 2015) amongst other pieces of legislation regulating the supply chain process. In summary these pieces of legislation play a significant role in the procurement of goods and services by promoting fairness, transparency, cost efficiencies and to redress the imbalances of the past. There are three projects in TPT which had noticeable cost overruns due to compliance with the various pieces of legislation mentioned in this section. The projects are discussed below.

- Conveyor Belt Washing Systems at SLD IOT (2017/18 FY). The project team went out to the market on the first attempt and there was a non-award of the tender due to the bid prices exceeding the approved project budget. The project team motivated for an increase of R299 945 in the project budget to align with the market prices and advertised the tender again. However, this time around the procurement strategy had changed to accommodate EMEs as encouraged by the Transnet PPM (2015). The quotations received from the EMEs were much higher than the revised project budget. This resulted in the project budget being increased further by R2,2 million in order to match the bid prices from EMEs.

- Construction of the 3rd Tippler for SLD IOT (2015/16 FY). The business case for the project mentioned that changing the procurement strategy into smaller packages to allow EMEs to tender affected the project budget. The change in strategy resulted in cost overruns. The cost overruns for the changes in the procurement strategy were not quantified separately in the business case. However, it was mentioned that the project did suffer cost overruns as a result of changing the procurement strategy.

- Acquisition of Hazmat Trailers (2016/17 FY). As discussed already in Table 4.2, TE had a first right of refusal for the tender. However, they did not have a prototype of the hazmat trailers. They spent a lot of time developing it, and after a considerable amount of time, they submitted a quotation which was R450 000 per trailer more expensive than the market prices.

### 4.3.6. Poor scope definition

Incomplete scope definition was mentioned in the business cases as one of the prominent factors affecting project budgets. The approved cost estimates for the projects below were negatively affected by changes to the approved scope of work.

- Upgrade of Slip Rings at RCB Terminal (2018/19). As mentioned above in Section 4.3.3, one of the reasons for the budget increase of R594 572 was additional work which was not part of the original scope of work. The work should have been done internally by the TPT maintenance department, however, for certain reasons, they did not do it and so it had to be included in the project scope of work. This meant that the scope of work had to be increased to accommodate for the additional work.

- Upgrade of the Electrical Substation at Durban AGRI Port (2018/19 FY). As mentioned above in Section 4.3.1, the project team omitted the compliance requirements of the OHS Act (1993) in the scope of work. An increase in the scope of work had to be approved at an additional cost of R1.1 million to construct a building which is compliant with the requirements of the OHS Act (1993).

- Refurbishment of Ship Loader at Durban AGRI Port Terminal (2018/19 FY). The main reason mentioned in the business case motivating for the increase in budget from R12,1 million to R40,7 million is that the scope of work issued to the market was inadequate. A condition assessment was performed by the Owner Equipment Manufacturer (OEM) prior to approaching the market in order to assist the maintenance department to

develop a comprehensive scope of work. However, the maintenance department omitted in the scope of work, some of the critical work which had been highlighted by the OEM because they felt that it was not safety critical. When bids were received from the market, they were higher than the project budget because the bidders felt that excluded work was important in order to ensure that the full project benefits were realised. This led to the scope and budget being revised.

- Electronic Invoicing System (2018/19 FY). TPT approved a project to automate its customer invoicing process. The approved budget had to be increased by R576 000 to accommodate changes which were identified by the users of the system during the testing and training phase of the project. The project team mentioned in the business case that the changes were unknown to the project team during the development of the original scope of work. It was also mentioned that the project team failed to engage all relevant stakeholders on the requirements of the new system.

- Time and Attendance System for CTCT (2015/16 FY). The project budget was increased twice because of changes in the project requirements. The original budget was increased from R2,1 million to R4,8 million and further to R5,6 million. The first approval of the project was in February 2012. It was for the installation of an access control system. An increase in budget was later approved in December 2015 to add time and attendance requirements to the original scope of work. This was done to align with the Transnet Group system which had this functionality. Another addition to the scope of work was approved in September 2017 to include other unforeseen additional work which was not part of the original scope. The project team noted in the business case that the delays by Transnet Group to make a decision on the project led to the identification of additional requirements.

- Safety Critical Work for East London Grain Elevator (2015/16 FY). The project budget was increased from R7.86 million to R18.65 million due to procurement delays which led to the condition of the grain elevator

worsening. The scope of work was then changed to accommodate the new repairs that needed to be done.

- Construction of the 3rd Tippler for SLD IOT (2015/16 FY) & Upgrade of Caillard Machines for RCB Terminal (2017/18). As already discussed in Section 4.3.1, the budgets for these two projects suffered cost overruns because of inadequate engineering studies which affected the scope of work.

- Fire Detection and Suppression System for Substations at SLD IOT (2015/16 FY). The project budget was increased from R70 000 to R1 041 872 due to inadequate scope of work. The project team noted in the business case that the approach to develop the scope of work internally was flawed because they did not have appropriate skills to do it. The increase in the budget relates to the services of a consultant who was hired to do a study and prepare draft the scope of work.

### 4.4. Study participants' perceptions

In this section the focus is on presenting the perceptions obtained from the study participants through the interview process. It was necessary to interview knowledgeable managers in TPT to obtain their perceptions about the causes of project cost overruns. This helped to validate the results obtained from the analysis of the business cases. The questions were structured in order for the researcher to get insight about the study objectives. The study participants were asked the research questions below.

- Do projects have clear scope definition?
- Is the duration of the project approval process reasonable?
- Are project cost estimates including contingencies reasonable?
- Which causes have the highest impact on cost overruns? And
- Can the causes be prevented?

The notes taken during interviews with the study participants were scrutinised repeatedly to identify themes and patterns. It must be mentioned that the themes identified from the results of the interviews were consistent with those

identified in the analysis of the TPT Projects Repository (2019) and business cases. The themes were categorised as follows:

- Lack of project management skills;
- Inadequate engineering studies;
- Inadequate scope of work;
- Bureaucracy in the project approval process;
- Over-regulation of the supply chain process; and
- Poor maintenance practices.

### 4.4.1. Lack of project management skills

All the respondents highlighted the lack of skills to manage projects as a prominent contributing factor to project cost overruns. Specifically, the respondents mentioned that TPT does not have Cost Engineers and Quantity Surveyors to assist the project team with quantification of the bills of material, quantification of the scope of work and calculation of accurate project cost estimates. They mentioned that without these skills the project budget becomes vulnerable to cost overruns. All the respondents mentioned that the project team has been relying a lot on historic rates and prices of similar projects in order to compile project budgets. However, this practice has not been effective because each project is different.

Respondents R10, R11, R12 and R13 mentioned, specifically that TPT does not have skills to perform market research for goods and services. This gap has resulted in service providers overpricing their services when they quote for TPT. Respondents R2 and R10 mentioned that it is a well-known fact that service providers add a premium when they bid for Transnet's work. They put it in this way, "*there is a TPT price and there is a normal market price*". Due to the fact that TPT does not perform market research, it becomes difficult to negotiate better rates during the tender negotiations. Respondent R8 mentioned that the lack of skills to perform market research leads to contractors under quoting just to get appointed to do the work and then they start to escalate prices once they have been awarded the contract. This leads to project cost overruns.

All the respondents mentioned that TPT lacks skills to determine proper risk contingencies for projects in order to ensure that the project cost estimates take into account all relevant risks and uncertainties for the project. As a result, a blanket contingency of 10% of the total project budget is provided to cater for uncertainties. The respondents felt that the project contingency amount should be based on a robust risk assessment and a scientific process.

Respondents R5; R6 and R15 felt that TPT does not have sufficient project managers and capacity to handle projects. Respondent R5 in particular mentioned that the current distribution of work load amongst project managers is not balanced.

Respondents R5; R7; R11; R13; R14 and R15 felt that TPT does not have adequate engineering skills to develop proper specifications and scope of work.

Respondents R6; R9; R13; and R14 mentioned that the issue of poor skills is also applicable to external service providers. Sometimes TPT appoints service providers who are not well experienced and they make errors which cost the project. Respondents R6 and R14 further mentioned that TPT does not have internal capability to vet the work performed by service providers to ensure that poor workmanship is identified early. Respondent 14 further mentioned that, the appointment of service providers who are not OEMs to do work on equipment exposes TPT to the risk of poor quality.

### 4.4.2. Inadequate engineering studies

Respondents R1; R3; R5; R6; R9; R10; R12; R13; R14; and R15 mentioned that some projects fall short of engineering studies. This leads to premature scope definition which, keeps on changing as the project progresses to the next phases. Respondent R12, specifically mentioned the Construction of the 3rd Tippler for SLD IOT (2015/16 FY) (Discussed in Section 4.3.1) as a classic example of how a lack of engineering studies led to project cost overruns. Respondents R6 and R13 mentioned that one of the limitations which makes

it difficult for the project team to perform proper studies is that sometimes there is pressure and rush by management to accelerate projects. Respondent R6 mentioned that the pressure and push from management to accelerate projects is caused by poor planning. This leads to the project team bypassing important studies aimed at firming up the scope of work.

### 4.4.3. Inadequate scope of work

All Respondents mentioned that there is a problem with the scope definition and this leads to cost overruns. Respondents R1; R5; R6; R14; and R15 mentioned, specifically that one of the reasons for scope changes for equipment refurbishment projects is that the project team is unable to access equipment to assess its condition before developing a scope of work. This is due to operational requirements. The team ends up making incorrect assumptions in the scope of work about the condition of equipment. It is only when the equipment is finally booked out of operation for the actual refurbishment, that the condition of machine components is fully known. It is at this stage that the scope of work tends to change.

Respondent R1 mentioned that one of the problems with the scope of work is that budgets for projects get approved first before the approval of the scope of work. This has serious challenges for the project team because sometimes they realise after the scope of work has been developed and approved that there is more work to be done which will require additional funds. This leads to further increases in the project budget.

Respondents R2, R5; R6; R9 and R13 mentioned that in general, there is a lack of project ownership by end users. End users tend to prioritise operations over important project meetings aimed at discussing specifications and the scope of work. Respondent R13 put it in this manner "*There is a lack of accountability from end users and there are no consequences*". This leads to users not accepting the project when it gets handed over to them. This results in changes to the scope of work to accommodate new operational requirements.

Another challenge with the scope of work which was mentioned by respondents R5; R6; R7; R9; R10; and R13 is that there are frequent changes to management structures. This leads to changes in business requirements which consequently affect the approved scope of work for the project.

Respondents R1 and R2 spoke about over-scoping the project requirements as another contributing factor. They mentioned that there is a tendency to deviate from the need and focus on fancy items which are not really needed for the project. This attracts expensive quotations from the market and leads to cost overruns. Respondent R2 asked the following question in trying to elaborate his point "*Is it necessary to specify paint with a life span of 10 years to be applied on equipment with a remaining useful life of five years?".* He mentioned that sometimes TPT pays higher prices for additional items which they do not need.

Respondent R5 mentioned that another problem which leads to changes in scope of work is failure to consider changes in technology during the scope development. OEMs tend to change technology of the machine components and phase out old components. This results in the OEMs charging higher prices for new technology. Therefore, tender prices tend to be higher than the approved budget.

Respondent R14 mentioned that sometimes work gets awarded to contractors who are not OEMs because of the Transnet PPM (2015) which prohibits confinement of the tender process. This results in serious challenges because a service provider which is not the OEM has to learn about the equipment and in the process quality and time get compromised. In addition, OEMs are not keen to share equipment drawings with other service providers because they regard them as their intellectual property. So if there are components which are required to be modified or replaced, the service provider has to first reproduce the drawings before they can manufacture the components. All of these additional requirements result in additions to the approved scope of work.

Respondent R14 mentioned further that where the development of the scope of work and design are outsourced, the same contractor which developed the scope of work is not allowed to tender for the project execution phase. This limitation creates problems for the new contractor who has to use a design which they did not develop. This often leads to changes in the scope of work.

### 4.4.4. Maintenance regime

Respondents R6; R7; R10; R13; and R14 felt strongly that there is poor maintenance regime in TPT and it affects the robustness of the scope of work especially, for equipment refurbishment projects. Sometimes maintenance activities get postponed due to different reasons including a lack of funds. Respondents R6 and R7, specifically mentioned that sometimes TPT cuts budgets for major maintenance activities. This leads to the postponement of maintenance work and the equipment deteriorates quicker. The budgets for equipment refurbishment projects end up increasing to cater for the shortfall in maintenance work.

Respondents R6; R7; R10; R13; and R14 mentioned further that there is poor recording of maintenance activities. There is insufficient data for the project team to predict the condition of equipment when developing the scope of work for equipment refurbishment projects. The project team ends up making assumptions about the condition of machine components. This leads to changes to the scope requirements and consequently cost overruns.

Respondent R14 mentioned that the TPT maintenance department does not have knowledge of the equipment because the equipment fleet consists of a variety of brands. The variety of equipment brands limit the maintenance team from understanding, learning about the equipment to increase their competence. Ultimately this results in poor scope definition.

Respondent R14 also mentioned that TPT does not have an engineering department, instead it has a maintenance department. He mentioned that the difference between the two departments is that the former does research and detailed root cause analysis on equipment whilst the latter performs

maintenance work. He mentioned that failure to perform research and root cause analysis about equipment limits the understanding of equipment and it leads to poor specifications.

### 4.4.5. Bureaucracy in the project approval process

Respondents R2; R4; R5; R6; R7; R8; R9; R10; R12; R13; and R14 highlighted bureaucracy in the project approval process as one of the contributing factors to project cost overruns. Respondent R12, in particular mentioned that the process of complying with the Transnet PLP (2015) is too onerous. Respondent R6 mentioned that it takes for ever for business cases to get approved. He mentioned that one of the reasons for the delays in the approval of business cases is the inclusion of signatories who were not part of the project from the start. They keep on asking for clarities which delay the process. Respondent R13 mentioned that there seems to be duplication amongst the different committees which are part of the project approval process and this wastes a lot of time. He mentioned further that sometimes the information supporting the business case is inadequate and this delays the project approval process. He also mentioned that there seems to be a lack of consequence management for project delays. Almost all the respondents mentioned that besides the fact that delays contribute to price increases, the other impact is the missing of the opportunities which the project is aiming to realise.

### 4.4.6. Over-regulation

Respondents R1; R2; R10; R13; and R14; mentioned that the restrictions below which are imposed by the Transnet PPM (2015) contribute to project cost overruns.

#### 4.4.6.1. Non-committal quotations

The Transnet PPM (2015) prohibits requests for non-committal quotations from the market. This makes the project budget to be vulnerable to increases especially because TPT does not have skills to benchmark market prices of goods and services in order to factor them in the project budget. Project managers have to rely on historic prices which may be outdated. When bid offers are received, they tend to be higher than the approved project budgets. This leads to non-award of tenders and project delays.

#### 4.4.6.2 Branding

The Transnet PPM (2015) prohibits the confinement of goods and services to specific service providers. Confinements are permitted under special circumstances only, but there is a lengthy approval process required by National Treasury. So this means TPT does not have liberty to appoint directly OEMs who have knowledge of the equipment. Instead a tender process has to be followed which can result in any service provider being appointed as long as they can demonstrate, during the tender process, that they can deliver the project. This results in some of the projects having quality issues and incurring cost overruns. Respondent R13 mentioned that TPT does not have proper skills to ensure that service providers who provide substandard work get eliminated during the tender evaluation process. The tender evaluation criteria are not robust. Many of the respondents mentioned that it is difficult for Transnet to compete with the private sector in the management of projects because of the stringent regulatory requirements.

#### 4.4.6.3 Approval of contract variations

The National Treasury Practice Note 3 of 2016/17 (Preventing and combating abuse in the supply chain management system) requires all construction contracts not to be varied by more than 20% of the initial contract value or more than R20 million. This introduces delays in the project because a motivation for the request to approve the contract variation has to be written internally by the project team, approved by the internal governance structures and the Group Chief Executive and then submitted to National Treasury. A lot of time gets wasted whilst waiting for approval of contract variations. During

that time the contractor may not perform any work and therefore TPT might incur additional charges for standing time.

Almost all the respondents mentioned that the project approval process is too long. By the time the project is approved a lot of things would have changed in the project environment. This exposes the budget to cost overruns. In other instances, by the time the project gets approved, the condition of the equipment would have deteriorated further rendering the approved scope of work irrelevant.

The following are the other contributing factors to project cost overruns which, were mentioned by various respondents.

- Foreign exchange losses.
- Inadequate post implementation reviews.
- Poor risk management.
- Lack of scientific calculation of the project contingency amount.
- Poor contract management.
- Lack of earned value management.

### 4.5. Conclusion

This chapter analysed data from business cases and perceptions from the study participants on cost overruns at TPT. Themes were identified from both the primary and secondary data sources. The results and findings from these two sources of data will be deliberated further in Chapter 5 including the findings from the literature review.

The results and findings of this chapter indicate that there are many challenges which contribute to project cost overruns in TPT. It appears from the results and findings of the analysis of the primary and secondary data that the themes are common and consistent. There were however, additional issues which were raised by the study participants which were not mentioned in the business cases. These issues gave insight to the causes identified in the analysis of secondary data. The following themes were identified during the analysis of data from both the primary and secondary data sources:

- Inadequate engineering studies have contributed significantly to project cost overruns. There were six projects where a lack of engineering studies was identified as one of the contributing factors to project cost overruns. Many interviewees also felt that lack of engineering studies has contributed to project cost overruns in TPT. The rush to complete projects seems to be the reason why studies are not performed.
- Lack of project management skills e.g. Cost Engineers and Quantity Surveyors, Risk Specialists and so forth was identified as another factor which contributes to project cost overruns in TPT. Cost estimates are not supported by bills of quantities and market prices. The project budget is not risk based. The work load is not evenly distributed amongst the Project Managers. The project contingency is a blanket 10% which does not cover all uncertainties. In addition, there are no skills to perform market research to ensure that risk of under or over quoting by service providers is mitigated.
- Poor maintenance practices were also identified as a contributing factor to project cost overruns in TPT. Maintenance activities get postponed affecting the useful life of equipment. The maintenance team battles to define accurate scope of work because of poor maintenance records. This results in changes in the scope of work during the project execution phase.
- Over-regulation of the supply chain process results in time delays, appointment of expensive EMEs and inflexibility to appoint OEMs who can deliver quality work.
- Long project approval delays have also contributed extensively to project cost overruns. Internal factors e.g. delays in the approval of business cases, delays in the approval of the scope of work, tender non-awards, chnges in the procurement strategy to restrict the tender to EMEs and so forth are some of the factors which contribute to project cost overruns.

The next chapter will discuss the findings, compare and contracst evidence from literature, business cases and from interviews with study participants.

# CHAPTER FIVE
# DISCUSSION

## 5.1. Introduction

The purpose of this chapter is to consider the findings and results raised in the previous chapter and to combine them with the information obtained from the literature review. Each of the study objectives is discussed relative to the findings of the study.

The study attempts to analyse the TPT Projects Repository (2019) and relevant project reports e.g. business cases, minutes and resolutions of CAPIC, for the financial years: 2015/16 to 2018/19 in order to compile a list of projects with cost overruns, quantify them, and examine the causes with the aim of making recommendations for future improvements.

## 5.2. Findings on the research objectives

There were two research objectives for the study. The findings are presented below for each of the study objectives.

### 5.2.1 To quantify the total Transnet Port Terminals project cost overruns for the financial years: 2015/16 to 2018/19.

It was established from the analysis of the TPT Projects Repository (2019) that there were 22 projects which had cost overruns during the financial period under review: R732 million (2015/16 FY); R32 million (2016/17 FY); R1,2 billion (2017/18 FY) and R83 million (2018/19 FY). The study found that TPT's projects are categorised as follows: New equipment, Equipment refurbishment and Infrastructure. Only two of the three project categories had cost overruns. 77% Of the projects with cost overruns were for infrastructure and 23% were for equipment refurbishment. There were no cost overruns incurred for the new equipment acquisition projects. The 22 projects with cost overruns exceeded their budgets by a range of 10% to over 200%.

### 5.2.2. To identify and analyse the causes of cost overruns for Transnet Port Terminals for the financial years: 2015/16 to 2018/19.

The study found that the causes of cost overruns for TPT projects are complex in that there is not just one cause responsible for the overruns. A project can have multiple causes which. Therefore, some of the themes have common elements or variables. The study found that the themes identified from the analysis of business cases and the interview results from knowledgeable managers at TPT were common. The study found that the themes in the study were aligned with the findings from the literature review, even though TPT has a unique project environment. The following six themes were identified: (1) lack of project management skills; (2) inadequate engineering studies; (3) procurement delays; (4) poor maintenance regime; (5) poor scope definition; and (6) over-regulation. The themes are discussed below.

#### 5.2.2.1 Lack of project management skills

The study found that TPT has a shortage of Cost Engineers and Quantity Surveyors to assist the project department with bills of quantities, project cost estimation and cost control. Given the fact that TPT is responsible for projects worth billions of rand, it is important that these resources be employed. Cost Engineers and Quantity Surveyors are crucial skills in the project environment to ensure that the cost estimates are based on accurate bills of quantities and that the project costs are tightly controlled. The absence of these crucial skills exposes the project budget to uncontrollable cost overruns. The absence of Cost Engineers and Quantity Surveyors was highlighted as one of the causes of cost overruns in the business case of the “Upgrade of Caillard Machines for RCB Terminal (2017/18)” project which experienced cost overruns in excess of R90 million. In addition, almost all the study participants mentioned the absence of these skills as a huge gap which leads to project cost overruns.

It is worth mentioning that TPT had started already a procurement process to source Quantity Surveyors, Cost Engineers, Risk Specialists and other professional skills at the time of performing this study.

Some of the study participants felt that the project budgets are not risk based. Even the contingency amount which is aimed at catering for uncertain events is not risk based. Instead a blanket 10% is provided as a contingency in the project budget. Bruggen and Luft (2015) and Xenidis and Stavrakas (2012) mention that project budgets which are not risk based tend to incur cost overruns. Teye Buertey et al. (2012) mention that most organisations have a tendency of basing the project contingency on 10% as a rule of thumb. Karisen and Lereim (2005) however warn that this method is inadequate, a scientific method is required to calculate the contingency amount.

The study also revealed that TPT does not have skills to perform market research in order to bench-mark prices of goods and services. The lack of experience in this area exposes TPT to the risk of over and under quoting by bidders. Both over and under quoting have serious consequences for the project budget. There are service providers who will under-quote just to get awarded the contract and then start escalating prices later on to make up for the difference. Sometimes service providers under quote and then cut corners in the project which results in poor quality issues and additional costs to do reworks.

Senouci et al. (2016) argue that often times due to desperation for work, bidders tend to under quote just to get awarded the contract and end up not delivering on the project or produce substandard work. This leads to reworks and increase in project costs. Waithera and Susan (2017) argue also that the reason for project cost underestimation is because of the temptation to make the project more viable in order to increase chances of approval.

Over-priced bids were mentioned as an area of concern by the study participants. Transnet is charged a premium because it is a parastatal. The lack of market research skills to bench-mark prices of goods and services combined with the absence of Cost Engineers and Quantity Surveyors to do cost estimates, expose TPT to the risk of inaccurate budgets, acceptance of over or under-priced bids, non-awards of tenders and time delays.

There were several projects which delayed as a result of tender non-awards. This was mainly due to the bid offers exceeding the project budget. The Refurbishment of Hoppers for RCB Terminal Project exceeded the budget by R5,3 million, mainly due to the fact that the price of steel was more than what was budgeted. All the bidders were presented bid offers which were above the budget.

There interview results also revealed that projects are not evenly distributed amongst the project managers. The uneven distribution of work results in some projects given more attention than others. This gap leads to project delays and consequently cost overruns.

Cantarelli et al. (2013) emphasized also that the shortage of appropriate skills in the project management field is one of the factors which contribute to project cost overruns and project failures.

#### 5.2.2.2. Inadequate engineering studies

The study revealed that sometimes engineering studies are not undertaken in order to assist the project team to understand the project requirements and to develop adequate scope of work. As a result, the scope of work keeps on changing to accommodate new requirements which were not known at the time of approving the project budget. There were six projects which were affected by this weakness. There are many causes for inadequate studies and one of them is pressure to complete projects due to tight deadlines from customers. When projects are accelerated a lot can happen e.g. cutting of corners, selection of wrong and costly solutions and so forth. TPT wasted millions of rand due to failure to perform studies.

A classic example was the Construction of the 3rd Tippler for SLD IOT (2015/16 FY). The business case mentioned that the causes of cost overruns which ran into billions of rand was due inadequate and outdated engineering studies. The project team had pressure to complete the project and as a result, studies were neglected. This negatively affected the scope of work. The omission of studies exposed the project scope to changes. The project

budget was increased twice during the life of the project because additional work which kept on being added to the project scope.

The Construction of the Warehouse in SLD MPT (2016/17 FY), is another example where a lack of proper research resulted in unnecessary cost overruns. The team failed to investigate the correct material to be used to construct the floor of the warehouse. They just assumed that because the same material was used in one of the warehouses in RCB Terminal then it would be appropriate for the SLD warehouse. Had the project team did an investigation, they would have established that the two warehouses handled different grades of cargo and used different pieces of equipment. Sadly, after a few months after the project had been completed the floor started to lift and to crack because of the pressure which was exerted by the excavator machine when scooping cargo from the floor. Additional funds of over R10m had to be approved to fix the floor.

Yap et al. (2017) argue that insufficient investigations prior to the approval of the project design is a major concern which leads to variation in the scope of work. It is better for the project team to spend time doing proper studies so that they can plan better and select the appropriate solution to address the problem. Corrections are more expensive to implement. Lee (2008) argues that some of the reasons for the changes in scope of work for port related projects are lack of planning and feasibility studies.

#### 5.2.2.3. Bureaucracy and procurement delays

This study found that there were seven TPT projects which suffered significant delays between the approval of the project budget and the appointment of the contractor (As illustrated in Table 4.3.4). On average using the delays from the seven projects presented in Table 4.3.4, the procurement delays per project were more than 24 months. There were various factors for the procurement delays which were highlighted in the business cases. They are listed below.

- Bid prices exceeding the approved budget.
- Stringent regulatory requirements.

- Bidders not complying with internal processes.
- Suitable bidders not found in the market.
- Delays in the approval of the scope of work.
- Variation of the scope of work and so forth.

The lack of skills to do project cost estimates and bench-marking of prices for goods and services resulted in bid prices exceeding the approved project budget. If the project cost estimates are less than the amount tendered, the tender is non-awarded, unless if the bidder is prepared to lower the tender price to be within the approved budget. As mentioned already in Section 5.2.2.1, there were several projects which had tender non-awards. Some projects had multiple tender non-awards and this affected the project time lines. Unless TPT addresses the skills gap in the project department, projects will continue to experience delays and cost overruns.

The outcomes of the data analysis revealed that the TPT project approval process is onerous. Concerns were also raised about the possibility of duplication of activities amongst the different governance project approval committees, to be specific, the Owner Requirements Specification Committee, Investment Forum and CAPIC. There is a lot of time that gets wasted by the project team trying to clear review queries raised by the different committees. All of these issues lead to project delays and cost overruns.

Whilst this study did not bench-mark the turnaround time for the project approval and procurement process however it appears to be long in TPT. The analysis of the seven projects which had procurement delays as discussed in Section 4.3.4, reveal that there are inefficiencies in the procurement process. Some of the projects like the Safety Critical Work for the East London Grain Elevator suffered overruns due delays in the appointment of a service provider. The delays rendered the original scope of work irrelevant because the condition of the grain elevator had deteriorated because of the procurement delays.

It does appear from the delays experienced in the refurbishment of the Conveyor Belt Moving Heads for RCB Terminal (2015/16), that there appears to be a lack of skill to produce meaningful scope of work. The scope of work for this project had to be submitted four times to the BSC for approval because it did not meet quality standards. It took more than six months for the scope of work to be approved by the BSC.

It also appears that TPT's management is indecisive and this has contributed to cost overruns. This argument follows the analysis of delays suffered in during the Time and Attendance System for CTCT (2015/16). The project started in February 2012 however, as late as September 2017, the project was still experiencing changes to the scope of work. It was mentioned in the business case that the Corporate Office at Transnet Head Office was not taking direction on the way forward about the project and this created opportunities for management at operating divisions to keep on adding new requirements to the scope of work.

Kagiri and Wainaina (2017) mentioned that bureaucracy in the procurement process was ranked as the number one root cause for project costs overruns in the study of the power projects in Kenya. They mentioned that it is typical in government entities that every box has to be ticked before a project is given the green light. In many instances the people entrusted with delegation are too cautious to the detriment of the project deliverables. Doloi (2012) and Mulla and Waghmare (2015) identified slow decision making process as one of the key contributors to project cost overruns.

TPT's projects are bound to incur cost overruns given the magnitude of delays. Prices of goods and services are adjusted upwards annually for inflation. The inflation factor on its own adds at least 5% variance annually to the project budget. So a project that is delayed by five years, could end up costing 27% more than the initial budget. This may be one of the reasons why there has been tender non-awards for some of the projects.

#### 5.2.2.4. Over-regulation

“Section 217 of the Constitution Act 108 of 1996 read with section 51(1)(a)(iii) of the Public Finance Management Act 1 of 1999 stipulate that Transnet must have and maintain an appropriate procurement and provisioning system which is fair, equitable, transparent, competitive and cost-effective” (Transnet PPM, 2015, p.16).

The Transnet PPM (2015) is a set of procurement guidelines for Transnet and its divisions, which are designed to ensure that Transnet obtains value for money in the procurement of goods and services in order to achieve its mandate whilst correcting the socio-economic imbalances of the past. The Transnet PPM (2015) therefore, promotes cost efficiency in the procurement process whilst achieving commercial, regulatory and socio-economic goals. The Transnet PPM (2015) is underpinned by Section 217, of the South African Constitution and Section 51(1)(a) of the Public Finance Management Act 1 of 1999.

The study found that sometimes compliance with the various pieces of legislation applicable to the supply chain process for SOEs resulted in the following impact: (1) significant project delays; (2) appointment of expensive service providers; (4) quality issues; and (5) consequently cost overruns. Sometimes the procurement strategy would restrict the tender process to the appointment of EMEs but this would come at a high cost to the project, because EMEs are much more expensive than big companies. A classic example was the Acquisition of Hazmat Trailers (2016/17 FY) project where TE had the first right of refusal for the tender. They spent months developing a prototype for the hazmat trailers whilst TPT was waiting. After finishing the prototype, they submitted quotations which were more than R450 000 per trailer expensive than what the market charges. In addition, the project was delayed by 27 months (as discussed in section 4.3.4). It was again mentioned in the business case for the Construction of a 3rd Tippler for SLD Terminal that the change in the procurement strategy to allow for EMEs to tender resulted in project delays and higher costs.

The Transnet PPM (2015) prohibits TPT from confining the tender process to specific service providers, for example, OEMs. The Transnet PPM (2015) prohibits the naming of brand names in the tender specification. This is viewed to be unfair and it does not promote fair competition. TPT has to follow an open tender process to source suitable service providers. This limitation results in the following impact:

- TPT is not able to specify specific brands of equipment which are reliable;
- TPT is not able to standardise its equipment fleet in order and to establish long term relationships with the OEMs in order to increase technical knowledge and competencies of the artisans about the equipment. This ends up affecting the quality of the scope of work; and
- TPT ends up not being efficient in the management of spares as it has to keep a variety of spares from different OEMs. This is costly and inefficient.

Where it even gets worse, is that TPT is not at liberty to appoint OEMs to do repairs on their equipment brands. Again TPT has to approach the wider market to appoint a suitable service provider that can repair the equipment. The outcome of the tender process could leave TPT with a service provider which is not the OEM. This is more like allowing a Mercedes Benz car to be serviced by TATA. This exposes the project to a plethora of challenges which include poor quality, time delays and so forth, as the service provider has to first learn the equipment. It becomes even more challenging when the service provider has to modify machine components, because the OEM will not release drawings for the component. The service provider will have to reproduce the drawings before implementing the modifications. All of these challenges lead to project delays and consequently cost overruns.

The study also found that TPT is not allowed by the Transnet PPM (2015) to obtain non-committal quotations from the market to use them during the calculation of project cost estimates. With the absence of market research capability, it becomes difficult to determine accurate cost estimates. As a results the bid prices tend to be more than the approved budget and this results in tender non-awards. TPT could battle for months and even years just

to appoint a service provider. All these restrictions contributed to project delays and cost overruns.

The Transnet PPM (2015) prohibits the appointment of the same service provider to execute the project if they did the design for the project. A different service provider has to be appointed to execute the project or to implement the design. This presents challenges for the project because the new service provider has to use a design which they did not produce. This may lead to design changes, lack of accountability and consequently cost overruns.

The National Treasury Instruction Note 3 of 2016/17, require contract variations exceeding R20 million or 20% of the original contract value, whichever comes first, to be approved by National Treasury. The thresholds work on a cumulative value. This can delay the project whilst waiting for motivations to be approved internally by the internal TPT governance structures and externally by National Treasury. To make an example of how complicated this could be, if a project had previous contract cost variations amounting to just under R20m, and as such did not require approval by National Treasury because they were below the ceiling, if another cost variation were to be required, for the same project, no matter how small it is, as long as it would result in the cumulative value exceeding R20m, approval from National Treasury would be required. A lot of time could be wasted seeking approval for a small contract variation which is insignificant compared to the value of the contract. This is so frustrating for the project team and it ends up resulting extra charges for standing time by the contractor.

The Transnet PPM (2015) and the underpinning pieces of legislation, even though they are serving a good purpose of fair procurement process and socio economic empowerment, however, they expose TPT to the risk of poor quality, expensive quotations and so forth. One might argue that the tender evaluation criteria must be robust to ensure that less qualified service providers do not get appointed. However, it must be mentioned that what bidders present on paper is sometimes different from what happens at the project site. Bidders do not get tested before they are awarded work. It is risky

to appoint a service provider which is not the OEM for the equipment to work on it. There is a risk of losing warranties.

It does appear from the discussion above that the Transnet's procurement process is over-regulated. Transnet may not be able to compete for opportunities with companies in the private sector because of over-regulation. There appears to be inflexibility in the decision making process.

Waithera and Susan (2017) argued that regulatory constraints is one of the causes of project cost overruns especially for state owned organisations. (Kagiri and Wainaina, 2017) mentioned that over-regulation is a challenge in state institutions because every box has to be ticked before a project is given a green light.

#### 5.2.2.5. Maintenance regime

The maintenance department is the custodian and owners of equipment. They are responsible amongst other things for planned maintenance, major equipment refurbishments, continuous condition assessments on equipment and so forth. In addition, they are responsible for the drafting of the scope of work for equipment related projects. It is important for the maintenance department to be properly capacitated to ensure that maintenance activities are performed on time in order to keep the equipment in a good condition. The study has revealed that there are several gaps in the maintenance regime which contribute to project cost overruns in TPT.

The main gaps are: (1) postponement of maintenance activities, (2) poor record keeping, (3) lack of skills. Each of the gaps are discussed in detail below.

There is evidence from the data analysis that there is a tendency by the maintenance department to postpone critical maintenance activities due to a variety of reasons. The business case for the Upgrade of Caillard Machines for RCB Terminal (2017/18) mentioned that one of the reasons for the cost overruns in that project, was due to the postponement of critical maintenance activities. When equipment is not adequately maintained it deteriorates much quicker than expected and its useful life gets reduced. The projects which are aimed at refurbishing equipment tend to be overburdened because they have to accommodate for the shortfalls in the maintenance work. Sometimes projects budgets are deliberately reduced in order to focus on work which the maintenance department regards as safety critical. However, these short cuts sometimes lead to project overruns. This was the case with the project to refurbish the Ship Loader at Durban AGRI Port Terminal (2018/19 FY). The maintenance department reduced the project scope which was based on a study conducted by the OEM. This resulted in the project suffering cost overruns because the appointed service provider deemed the excluded work packages as critical in the realisation of the overall project benefits. The excluded work packages had to be added back to the scope of work. It appears that the maintenance department sometimes make wrong decisions about the extent of work which needs to be done on equipment, and this results in project delays and unnecessary cost overruns.

Poor record keeping and failure to utilise the SAP system were highlighted as areas of concern which contribute to project cost overruns at TPT. The maintenance department does not keep accurate maintenance records to enable the project team to accurately estimate the amount and extent of work that needs to be done during equipment refurbishments projects. There is no reliable data about history of maintenance activities on equipment. The scope of work ends up being drafted based on wrong assumptions.

TPT has challenges with maintenance skills including knowledge of the equipment. According to Respondent 14, the main challenge for the maintenance department is the non-standardisation of the equipment fleet. It has a variety of equipment brands. This limits the understanding of equipment

by the maintenance team. It is important for the maintenance department to standardise the fleet of equipment so that they can master it and establish long term relationships with the OEMs. In that way knowledge transfer is made possible and the level of understanding about the equipment increases within the maintenance team. Failure to understand equipment needs results to the maintenance team not being competent to draft adequate scope of works and specifications.

Another concern which was highlighted by Respondent R14 is that TPT does not have an engineering department instead it has a maintenance department. As explained in Section 4.4.4, the difference between the two departments is that the former focuses on research, root causes analysis and efficient ways of improving the reliability of equipment whereas the latter focuses on attending to planned maintenance activities and breakdowns.

Respondent 14 mentioned further that TPT does not have a computer-aided design (CAD) software which is used to create precision machine drawings. When service providers who are not OEMs get appointed to do work on equipment they spend a lot of time trying to produce new drawings for spare parts. This leads to cost overruns and project delays.

#### 5.2.2.6. Inadequate scope of work

Newton (2015) mentions that the scope of work should be well defined and established as accurately as possible as it informs the amount of resources, time and costs required to complete the project. Ambiguity must be eliminated in the scope of work. The scope of work should address both present and future needs to ensure that there are no subsequent changes once it has been approved.

It must be noted that time, cost, quality and scope have strong relationships amongst each other. Impact on one of these elements will affect others, as Ebbesen (2013) illustrated in the “Iron Triangle” in Figure 2.2. It will be noted in the discussion below that there were a lot of factors discussed above in Sections 5.2.2.1 to 5.2.2.5 which affected the scope of work.

As discussed in the previous sections inadequate scope of work was mentioned as one of the main contributing factors for project cost overruns for TPT's projects. There were many respondents who mentioned poor scope of work as a fundamental cause for project cost overruns. The study found that inadequate scope of work was affected by a number of factors, some of which have been discussed already in Sections 5.2.2 and 5.2.5. The factors contributing to inadequate scope of work are discussed below.

The study discovered that TPT approves the project budget prior to the approval of the detailed scope of work. This is challenging because sometimes the detailed scope of work comes with additional work requirements which may require additional funding. So the project team may have to come back to CAPIC to request additional funds. This results in unnecessary cost overruns.

Sometimes TPT has to perform condition assessments for equipment in order to understand the requirements of the scope of work. Condition assessments require equipment to be booked out of operation because sometimes it may require to be stripped in order to assess the condition of hiden components. This becomes a challenge for operations because they have tight operational targets, so they cannot afford to release equipment. Therefore, operations becomes reluctant to release equipment. They prefer to release it when the contractor has been appointed to do the actual repairs. This limitation forces the project team to make a lot of assumptions about the condition of equipment when drafting the scope of work. The lack of proper maintenance records compounds the problem, because the project team does not have reliable data to base their assumptions. This gap exposes the project to scope changes and cost overruns.

Another gap which the study has discovered is inadequate engineering studies. Inadequate engineering studies results in the development of immature scope of work, which keeps on changing as the project advances to other phases. Proper studies including assessment of site conditions, detection of underground services, operational readiness plans and so forth

should be done upfront in order to ensure that the scope of work addresses all the project requirements. TPT has failed in many instances to do proper studies and this has resulted in millions of rand in cost overruns.

Some of the study participants felt strongly that TPT does not have proper skills and competencies to write a meaningful scope of work. Respondents 7 and 14 mentioned, specifically that the maintenance department does not have adequate knowledge of the equipment. This results in poor equipment specifications and substandard work.

Another important concern is that there is a lack of involvement of the end users and project owners in the initial phases of the projects. They do not attend project meetings where important scope requirements and specifications are discussed. This results in sub-standard specifications and scope of work; commissioning delays and last minute changes to the original scope of work to accommodate new user requirements. The Electronic Invoicing System (2018/19 FY) project (as discussed in section 4.3.6), is an example of how a lack of users' involvement in the project resulted in changes to the scope of work.

Over specifying the project requirements was also mentioned as an area of concern by the some of the study participants. It appears that TPT sometimes goes for fancy items in the specifications for projects. This results in unnecessary cost overruns. This may be due to lack of experience from the technical team.

Whilst TPT's circumstances are different and unique however, poor scope of work is a prominent topic in literature and it has been recognized as one of the major contributing causes to project failures in general and cost overruns (Mirza et al., 2013). According to Farok and Garcia (2016) project management plans are almost certain to change before the completion of the project. The sooner the changes are identified the lesser the impact on the budget (Yap et al., 2017).

## 5.3. Conclusion

This chapter was aimed at the discussion of the findings from the analysis of the primary and secondary data using a thematic method and descriptive statistics. The themes identified for both primary and secondary data analyses were the same and there was evidence from literature review that the same issues affecting TPT have been identified in past studies. The following themes were identified as the main causes of cost overruns for TPT projects:

- Lack of project management skills;
- Inadequate engineering studies;
- Procurement delays;
- Poor maintenance regime;
- Poor scope definition; and
- Over-regulation.

The next chapter is about the conclusions which have been drawn from the study and recommendations. The chapter will assess whether each of the study objectives has been achieved.

# CHAPTER SIX
# CONCLUSIONS AND RECOMMENDATIONS

## 6.1 Introduction

This chapter presents conclusions and recommendations arising from this study and to recommend topics for future studies.

The purpose of this study is to investigate the causes of cost overruns for TPT projects. The data was analysed from the TPT Projects Repository (2019), business cases for projects, CAPIC minutes and resolutions where budgets were approved and 15 interviews with knowledgeable managers from TPT.

## 6.2. Summary of conclusions

The study has the following findings in relation to the following objectives.

### 6.2.1 Objective One, to quantify the total project cost overrun for the financial years: 2015/16 to 2018/19.

As already discussed in Section 5.2.1, it is concluded from the analysis of the TPT Projects Repository (2019) that there were 22 projects which incurred cost overruns during the 2015/16 FY to 2018/19 FY, amounting to R2 084 447 650. The following is a breakdown of the cost overruns per financial year: R732 million (2015/16 FY); R32 million (2016/17 FY); R1,2 billion (2017/18 FY) and R83 million (2018/19 FY). The 22 projects with cost overruns exceeded their original budgets by a range between 10% to 200%. The 22 projects are categorised as follows: Infrastructure (77%) and Equipment Refurbishment (23%). There were no cost overruns for new equipment acquisitions.

### 6.2.2 Objective Two, to identify and analyse the causes of project cost overruns for Transnet Port Terminals for the financial years: 2015/16 to 2018/19.

The study concludes based on the findings that the six main themes below contributed to the project cost overruns in TPT.

- Lack of project management skills;
- Inadequate engineering studies;
- Procurement delays;
- Poor maintenance regime;
- Poor scope definition; and
- Over-regulation.

There is a shortage of relevant project management skills, specifically Cost Engineers and Quantity Surveyors to assist the project department with accurate cost estimates to support project budget. In addition, TPT does not have specialists to perform market research in order to benchmark prices for goods and services. These gaps have resulted in contract award delays, risk of over or under quoting by service providers, and consequently significant cost overruns. The study also concludes that work amongst the TPT project managers is not equally distributed. All these factors have an impact in the successful delivery of projects and cost overruns.

Inadequate engineering studies have contributed to project cost overruns at TPT. The lack of studies resulted in the development of premature scope of work and consequently cost overruns. Amongst other projects, the construction of the 3rd Tippler for the SLD Terminal highlighted this weakness as one of the major contributing factors to the project cost overruns.

Poor maintenance regime in TPT is another prominent cause which contributes to project cost overruns. The following gaps exist within the maintenance regime:

- The technical department is not skilled to produce robust scope of works especially for equipment refurbishment projects. This is caused by a number of factors including, non-standardised equipment due to the restrictions on branding imposed by the Transnet PPM (2015).
- There is a tendency to postpone maintenance work and to reduce budgets. This increases the scope of work for equipment refurbishment projects.
- There is poor record keeping of maintenance activities which results in lack of reliable data to predict the condition of machine components during the development of the scope of work.

There are significant delays in the project approval and the procurement processes. Delays can take months to years just to appoint a service provider. The following factors contribute to the delays:

- Internal inefficiencies in the approval of business cases, delays in the approval of scope of work and slow decision making process;
- External factors e.g. stringent regulatory compliance requirements, bidders not meeting the tender requirements and so forth; and
- Inaccurate cost estimates which lead to tender award delays.

Inadequate scope of work has contributed to project cost overruns at TPT. There are several factors which contribute to inadequate scope of work, which include:

- Inadequate project studies;
- Approval of the project budget prior to finalisation of the scope of work;
- Lack of access to equipment to perform condition assessments;
- Lack of competencies with the maintenance department to develop robust scope of work; and
- Lack of involvement by end users in the development of the scope of work.

Compliance with the regulatory requirements which includes the Transnet PPM (2015) have created inflexibilities and over-regulation of the procurement process. This resulted in time delays and higher prices being paid due to the appointment of EMEs. The limitations on branding impossed by the Transnet PPM (2015) have resulted in the non-standardisation of the equipment fleet. This limits the understanding of equipment by the technical department and, it exposes TPT to the risk of poor spares management, poor workmanship and cost overruns.

### 6.3 Summary of recommendations

The following key recommendations arise from the findings of the study.

6.3.1 The study acknowledges that the process to recruit relevant resources including the Cost Engineers and Quantity Surveyors amongst other resources to capacitate the project department is underway already and recommends that the initiative should be supported.

6.3.2 TPT should appoint specialists in the Supply Chain Department to perform market research in order to bench-mark prices of goods and services.

6.3.3 The planning of projects must be improved to allow time for adequate engineering studies and research in order to improve the precision of the scope of work.

6.3.4 The maintenance department should adopt the Asset Management Life Cycle in order to ensure that assets are professionally mantained. Sufficient budget should be made available for critical maintenance work. Postponement of critical maintenance work should be discouraged. The maintenance department should improve record keeping by fully utilising the SAP Planned Maintenance module.

6.3.5 TPT should review the capital project governance structures i.e. ORS Committee, Investment Forum, CAPIC and BSC to ensure that bottlenecks

are reduced. TPT should invest in an electronic business case approval system which will track business case approval delays on a real time basis.

6.3.6 Whilst it is appreciated that the various pieces of supply chain legislation are aimed at complying with the South African Constitution and to redress the economic imbalances of the past, it is however recommended that Transnet should develop a relationship with National Treasury in order to discuss ways to reduce inflexibility and over-regulation in the procurement process.

## 6.4 Recommendation for future studies

There is an opportunity for a study to findout whether it is possible for SOEs to be efficient in the delevery of capital projects whilst complying with relevant pieces of legislation which governs the supply chain process e.g. PFMA, PPPFA, various applicable Treasury Instruction Notes and so forth.

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## Appendix 1: Informed Consent Letter

**UNIVERSITY OF KWAZULU-NATAL**
**GRADUATE SCHOOL OF BUSINESS AND LEADERSHIP**

Dear Respondent,

**MCLS Research Project**
**Researcher**: Mr. Sifiso Sibusiso Mavuso (083 783 7657)
**Supervisor**: Dr. Mihalis Chasomeris (031 260 2575)
**Research Office**: **HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION**
Research Office, Westville Campus
Govan Mbeki Building
Private Bag X 54001
Durban
4000
KwaZulu-Natal, SOUTH AFRICA

I, Sifiso Sibusiso Mavuso a Master of Commerce Leadership Studies student, at the Graduate School of Business and Leadership, of the University of KwaZulu Natal. You are invited to participate in a research project entitled, "Examining causes for cost overruns in projects at Transnet Port Terminals". The aim of this study is to: Analyse the projects database for the financial years: 2015/16, 2016/17 and 2017/18 in order to compile a list of projects with cost overruns, examine and rank the causes in the order of their impact on cost overruns and understand their relationships and complexities, and make recommendations for future improvements.).

Through your participation I hope to understand the causes which contribute cost overruns in projects. The results of the focus group are intended to contribute to the implementation of recommendations to prevent or reduce cost overruns.

Your participation in this project is voluntary. You may refuse to participate or withdraw from the project at any time with no negative consequence. There will be no monetary gain from participating in this survey/focus group. Confidentiality and anonymity of records identifying you as a participant will be maintained by the Graduate School of Business and Leadership, UKZN.

If you have any questions or concerns about completing the questionnaire or about participating in this study, you may contact me or my supervisor at the numbers listed above.

The survey should take you about 20 minutes to complete. I hope you will take the time to complete this survey.

Sincerely

Investigator's signature_____
Date_____

**UNIVERSITY OF KWAZULU-NATAL**
**GRADUATE SCHOOL OF BUSINESS AND LEADERSHIP**

**MCLS Research Project**
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**CONSENT**

I……(full names of participant) hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to participating in the research project.

I understand that I am at liberty to withdraw from the project at any time, should I so desire.

I hereby provide consent to:

| | |
|---|---|
| Audio-record my interview / focus group discussion | YES / NO |
| Video-record my interview / focus group discussion | YES / NO |
| Use of my photographs for research purposes | YES / NO |

SIGNATURE OF PARTICIPANT DATE

……

**This page is to be retained by researcher**