Effective Project Management Controls for Capital Projects in the Public Sector of Namibia

(2012 – 2013)

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DEDICATION

I dedicate this research to the indigenous African who, by force, was removed from his indigenous knowledge system and has to now resort to gaining new and foreign knowledge in an attempt to better his well-being. It is my hope that this paper will increase the success rates of projects operated by the indigenous African as he attempts to operate in a system, inherited from his former colonial powers, that is so far removed from his indigenous roots.
DECLARATION

I do hereby declare that this research work is my original work and has never been submitted to any other institution in a bid to gain any other academic qualification.

Student’s Signature: .......................................................................................  
Date: ............................................................................................................
ACKNOWLEDGEMENTS

First and foremost I wish to thank GOD, JEHOVAH Almighty, for giving me the grace, wisdom and understanding to undertake this dissertation. HE gave me understanding of difficult concepts, showed me how to link different ideas, gave me much needed encouragement and strength to stay awake from the late hours of the night into the early hours of the morning preparing this paper. Without HIM this paper would not have become a reality.

I also extend my deep gratitude to the Permanent Secretary of the Ministry of Works of Transport, Mr. Peter Mwatile, who gave me the permission to undertake this study within his domain of responsibility, and to the Director of Capital Projects Management, Mr. B. F. Booysen who took up my cause with the Permanent Secretary to enable me to undertake this study. My gratitude also goes to my supervisor Lic. E. Makoni for his guidance and advice through this research.

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Last, but definitely not least, I wish to thank my parents and my sisters, who even when 2000km away, did not fail to reach me with their spiritual, emotional and financial support in my endeavours; thank you very much.
ABSTRACT

Capital projects implementation in the public sector of the Republic of Namibia has become a topic of concern. Twenty-four years after gaining independence, capital project success rates are still below 60%. This, unfortunately, is not in line with the Ministry of Works and Transport’s 2012 – 2017 strategic plan which aims to achieve 100% customer satisfaction by year three of the plan’s implementation. The need for appropriate and effective project management control tools to deliver capital projects successfully, that is on time, within budget, and to the correct quality, has become fundamental in order to perform to the 2012 – 2017 Ministry of Works and Transport Strategic Plan.

This research sought to ascertain the current project success status, diagnose the problems with the existing project management approach in use, identify causes of problems diagnosed, and by elimination of the said causes recommend a system of project controls that will be effective in the delivery of public capital construction projects in Namibia. These objectives were realised using both survey and non-survey methods, namely questionnaires and interviews for survey methods, and observation and collection of primary documents such as project minutes in the non-survey methods.

The research found that poor planning and organising, lack of skill and limitations pertaining to consultants’ supervision were the main challenges leading to project delivery out of the agreed schedule, cost, and quality parameters. The research recommended a project control system largely focussed on management planning and organising within the Ministry of Works and Transport, that is expected to increase project delivery success rates to meet the Ministry of Work and Transport’s 2012 – 2017 strategic plan for infrastructure development and maintenance.
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LIST OF ABBREVIATIONS

CIF: Construction Industries Federation of Namibia
CPM: Capital Project Management
DOW: Department of Works
MWT: Ministry of Works and Transport
INQS: Institute of Namibian Quantity Surveyors
NIA: Namibian Institute of Architects
PMI: Project Management Institute
PMBOK: Project Management Body of Knowledge
PRINCE2: Projects in Controlled Environments
PRiSM: Projects integrating Sustainable Method
CHAPTER 1: INTRODUCTION

1.1 INTRODUCTION

Today, more than ever, the public sector is under pressure to improve performance and produce visible results with tax-payers’ monies (Curristine, Lonti, Joumard, 2007). As larger proportions of the national populations become more dependent on public facilities following the financial impact of the 2007/2008 global recession, the public sector has experienced increased demand on its services. In Africa, and most of the developing world, an additional push factor of the Millennium Development Goals has put pressure on governments to succeed in their project initiatives, hence increasing awareness of the importance of public project management. According to Wirick, (2009) managing projects is always a challenge but managing public projects is an even greater challenge. In an interview with Profit magazine Wirick said,

“If you can manage a public project, you can manage anything.”

Project Management challenges multiply in the public sector due to the shortage of good project management skills and inadequate controls in the public sector (Wirick, 2009). In the developing world the predicament of public sector project management worsens because the implementation of project management tools and techniques is still in its early phases of development (Ali, 2010). Project management skill and tools enable project teams to foresee or predict as many dangers and problems as possible thereby mitigating the negative impacts of risk in the operating environment. Lack of, or under-development, of such tools results in development failures and ‘run-away’ projects that lead to substantial losses (Susilo, Heales, Rohde, 2007).

As argued by Susilo et al (2007) one important strategy in mitigating risk is the use of effective controls. Proyect control is that element of a project that keeps it on-track, on-time and within budget (Lewis, 2000). The aim of this dissertation is to recommend an effective set of tools in the Capital Projects Management (CPM) project management framework so as to enable delivery of physical infrastructure projects in accordance with the Ministry of Work’s 2012 – 2017 Strategic Plan. This research, through survey and non-survey methods, firstly takes a diagnostic approach so as to determine the problems and challenges currently faced by CPM in its delivery of capital projects. Following the diagnosis the research will then
recommend project management action that can be taken by the CPM division to reduce execution slip in its project implementation.

Numerous studies have been undertaken in areas of public service delivery understanding and improvement for example Curristine, Lonti, Joumard, (2007), (2010), Ramachandran (2011) all of which largely point towards the New Public Management Model (NPM) generated during Thatcher’s tenureship which advocates for the adoption of private sector practices within the public sector, namely deregulation of management structures, government autonomous agencies, performance based evaluation, introduction of competitions and public-private partnership and privatization to combat ineffective service delivery (Kajimbwa, 2013). Though the Ministry of Works and Transport has adopted the NPM practices, as evidenced by their 2012 – 2017 Strategic Plan showing various Key Performance Indicators, a control system that will ensure the realisation of this plan seems to be missing. In addition to this there also appears to be little literature pertaining use of controls to effect successful delivery of public capital construction projects. Furthermore, the little literature that exists on this topic is largely derived from studies conducted in developed countries and as such results cannot be generalised to developing countries. As a result this dissertation focuses on control tools used in the public sector focussing on Namibia, a developing country, using a case study of the Capital Project Management (CPM) division, a wing within the Department of Works (DOW) of the Ministry of Works and Transport (MWT) of the Republic of Namibia.

1.2 BACKGROUND

For the past decade, or so, the Namibian Capital Projects Management (hereafter referred to as CPM) division, a division operating under the Department of Works (hereafter referred to as DOW) within the Ministry of Works and Transport (hereafter referred to as MWT), has been blamed for poor and inefficient delivery of capital construction projects. According to an internal report, resource scarcity has often been the scapegoat for the division’s poor project delivery. The report states that the management, professional and technical staff in the divisions pivotal to the delivery of capital
construction projects (Architectural, Engineering, and Quantity Surveying Services), have been ‘snowed under’ by administrative work due to the lack of staff. In its 2012-2017 strategic plan, one of the MWT’s initiatives is to recruit skilled and competent staff at all levels (2012 – 2017 Strategic Plan, Ministry of Works and Transport, Government of the Republic of Namibia). It is in response to this initiative that the Namibian government approached the Government of the Republic of Zimbabwe with a request to second 97 construction professionals qualified in the architectural, engineering and quantity surveying disciplines to work on various Namibian capital construction projects. Subsequently, a Memorandum of Understanding (MoU) was signed in May 2012 to second the said professionals to Namibia (Kapitako, June 2013). The professionals’ role would be to oversee government capital projects in the CPM department of the MWT and perform the role of project managers in the Namibian government’s capital construction projects.

Apart from lack of expertise within the government Namibia is also faced with several challenges most of which are a result of colonial rule and apartheid policies. Challenges specific to infrastructure development are as follows:

- **Low availability of labour** – availability of labour is reduced by country’s small population. According to Namibia’s National Planning Commission Vision 2030 report Namibia has a relatively small population of 1.8 million and this presents a limited (labour) market and presents constraints on domestic expansion of production.

- **Low skill base** – According to the Namibia National Planning Council Vision 2030 Final Technical Report on macro-economic issues there is an acute shortage of skilled manpower in the country which is largely due to the poor education system to which the majority of Namibians were subject prior to Namibia’s independence. This is also noted in the 2012 British report on ‘Doing Business in Namibia: A Guide for UK Companies, which states that well educated, skilled staff are at a premium, and those that combine this with excellent spoken and written English skills are even fewer and further apart, therefore recruitment is one of the biggest challenges faced in the country. This problem is worsened by the difficulties associated with securing work
permits and visas from the Ministry of Home Affairs for foreign skilled personnel.

- HIV/AIDS affecting undermine labour availability and performance –
  According to the UNAIDS 2012 report HIV prevalence amongst ages 15 – 49 is 13.4%. This is amongst the highest in the World (www.indexmundi.com).

- Language barriers: The official language in Namibia is English used in all of its formal domains including in construction industry. However, according to Frydman (2011) English is the first language of the smallest percentage of Namibia’s population (0.8%). In contrast indigenous African languages are spoken by 87.8% of the population whilst only 11.2% speak and understand the three Indo-European languages (English, German, and Afrikaans) in the country. This creates a communication barrier especially for SME contractors who are largely indigenous Bantu speaking nationals.

- A culture of poor work ethic within government organisations and parastatals combined with a developing consumer generation.

- High income inequality: According to the International Monetary Fund’s World economic survey the Namibia has a US$13,764 billion economy with an estimated US$6 610 GDP per capita. An Independent evaluation of the UNDP Country programme document (2010) classifies Namibia as a higher middle income country with an UNDP. Even with middle income classification the high inequality of income distribution with 55% of the population being unemployed and living below the poverty datum line.

The challenges described above all together put constraints on the efficient operation of the Department of Works in its delivery of capital projects.

According to a 2012 report by the United Kingdom’s High Commissioner to Namibia, ‘Doing Business in Namibia’, since the country’s independence, the SWAPO Government, having inherited a racially distorted society and economy resulting from colonialism, has sought to “Africanise” its economy by seeking to empower
previously disadvantaged people groups. Some programmes embarked on include the 2011’s New Equitable Economic Empowerment Framework (NEEEF), Targeted Intervention Programme for Employment and Economic Growth (TIPEEG), and tender board regulations that are aimed at “operationalising” Namibia’s Africanisation/indigenisation programme. These stimulus, though, have been predicted to be unsustainable by Business Monitor International’s Namibia Infrastructure Report Q2 2014. As such the government would need more than the employment of technical skills to ensure success in its public infrastructure development.

1.3 RESEARCH PROBLEM

The secondment of the Zimbabwean construction professionals to the Namibian Department of Works is deemed to be one of the solutions to a decade long problem of poor project delivery. At an official dinner welcoming 65 of the 97 Zimbabwean construction professionals, the Minister of Works and Transport, Mr. Erkki Nghimtina, said:

“I'm the happiest man having all these experts. Everyone was [saying] that the Ministry of Works (and Transport) was not performing; now we are performing...”

(Kapitako, 3 June 2013)

However Namibia is faced with more challenges than just skills shortage which affect the efficient delivery of public infrastructure development. Therefore without appropriate and effective controls, it will be difficult to deliver construction projects to the various End User-Ministries on time, on budget, and with required features and functions. The current control system though functional, is still riddled with project over-runs resulting in dissatisfaction in the government with the Department of Works. It is therefore necessary that the CPM division produce a system of appropriate project controls that will be effective in increasing the success rates of public project implementation.
1.4 RESEARCH AIM

The aim of this research was to recommend a project control system that will deliver public construction capital projects on time, within budget, and to the correct quality, for use by the Namibian Capital Projects Management.

1.5 OBJECTIVES

In order to achieve the research aim, this study undertaken the following specific objectives:

1.5.1 To ascertain the current status of project delivery success within the CPM division
1.5.2 To ascertain effectiveness of current control tools in use at the CPM division
1.5.3 To identify the major challenges faced by the CPM division in the delivery of capital construction projects and perform a “root-cause” analysis for the challenges identified
1.5.4 To ascertain the factors critical to the successful management, and delivery of capital construction projects at CPM
1.5.5 To recommended a control system/model suited to the CPM specific challenges

1.6 RESEARCH QUESTIONS

The research objectives above are translated into the following research questions:

1.6.1 How many projects are being successfully delivered in the CPM division?
1.6.2 How effective are current control tools in use at the CPM division?
1.6.3 What are the challenges, and root causes of those challenges, that the CPM division is facing in delivering projects?
1.6.4 What are the conditions necessary for the success of public projects?
1.6.5 What can be done to the current public project management system to increase successful delivery of public projects?
1.7 HYPOTHESIS

If the CPM division of the DOW implements a new set of controls, arrived at by investigation and elimination of specific root causes of challenges, project delivery success in the public sector of Namibian will increase to meet the MWT’s 2012 – 2017 Strategic Plan goals.

1.8 JUSTIFICATION

The study is essential due to its practical relevance. The study addresses a very pertinent and urgent need in public infrastructure delivery in Namibia’s – the development of country and situation specific control systems. This would benefit not only the Department of Works and various Namibian user-Ministries, but the Namibian population as a whole. Also Chapman (2004) cited in Ali (2010) alludes to the fact that the current project management theories are based primarily on North American research and experience. The project management frameworks are therefore not always appropriate for application in Namibia due to different background factors such as nation demographics, and social development and public policy. Of particular interest, however, is an investigation into project management practices in the public sector in developing countries by Ali (2010). The case-study country was Pakistan whose national demographics, social development and culture vary greatly to the Namibia scenario. Other literature of note are recent global surveys on factors affecting successful implementation of capital projects, two of which are mentioned in Chapter 2 of this research, were conducted largely in developed countries with only one African country included in the survey, South Africa. Also, considering public management efficiency, most literature focuses on OECD government organisations. As a result the challenges and recommendations resulting from such studies cannot simply be adopted by developing countries like Namibia as the background environment of such studies greatly differs from that of Namibia and other developing countries.

1.9 SCOPE OF THE RESEARCH

For the purpose of this research the Capital Projects Management division (CPM), the division responsible for implementation of Namibia’s public capital
projects, was selected as the environment of this study. Also for this research the PMBOK is the selected project management reference due to its generic and wide applicability. The units under study in this research are project delivery in terms of time, cost and quality, with quality being defined as the degree to which the end-user’s requirements are met by the project, from the time the user ministry approaches the CPM division with a project idea to its complete construction and hand-over to the end-user ministry.

1.10 RESEARCH OUTLINE

This dissertation is divided into five chapters, namely Chapter 1 – The Introduction, Chapter 2 – The Literature Review, Chapter 3 – The Research Methodology, Chapter 4 – Data Presentation and Analysis, and Chapter 5 – Conclusions and Recommendations.

Chapter 1 briefly describes the importance of project controls in the implementation of public project; give the background of the problem before presenting the research problem and the research aim. The chapter then details the objectives, research questions, hypothesis, and scope of the research that will enable the achievement of the research aim.

The purpose of the second chapter is to review the work by other researchers in the areas of implementation and management of capital projects, challenges and success factors for managing capital projects in the public and private sector, and project control tools for different capital project aspects, before describing challenges particular to the Namibian operating environment.

Chapter 3 describes how the researcher carried out the research by detailing the research approach, the sampling procedure, and the data collection tools employed. This chapter also describes the validity of the data which justifies the use of selected data collection techniques and tools. The researcher then explains limitations of the research in terms of limited capacity and limited data capture time.
The fourth chapter’s purpose is to present data collected in the field in a logical and sequential manner which allows for ease of analysis of such data so as to enable deduction of correct conclusions.

Lastly Chapter 5 concludes the research by relating the data collected and analysed to the research objectives, thereby enabling the fulfilment of the research aim of recommending a project management control system suitable for the challenges faced by the CPM division.

1.11 CHAPTER SUMMARY

This chapter has been the introduction to this research highlighting the cause or case for this research in section 1.2: Research Problem. The background explained The Department of Works’ decade long difficulty in successful project delivery which they have now attempted to circumvent by the acquisition of skills relevant to the key functions in its project delivery process. However, keeping project delivery on time, within cost, and within the require quality frames will require more than the acquisition of skill. Such skill will have to organised and work coherently within a organisational structure supportive of the accomplishment of the Ministry of Work and Transport’s 2012 – 2017 Strategic Plan. The researcher, though this research aims to recommend/formulate a project management control system that will be appropriate for the Capital Projects Management division though firstly diagnosing of the challenges faced with the current project management system, then determining success factors for project delivery, and finally assessing the Namibian operating environment before any changes to the current project control system can be recommended. By triangulation of quantitative and qualitative methods the researcher will gather field data which will be presented and analysed in a manner that will enable logical recommendations to the current project management control system within the Namibian CPM decision.

The last section of the chapter the research outline is described showing the development of the research from analysis of relevant literature and concepts to the research conclusion.
CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

http://people.wcsu.edu defines Literature Review as a summary of research that has been published about a particular subject. It provides the reader with an idea about the current situation in terms of what has been done. The Literature Review is conducted for several reasons including ensuring the reader obtains thorough understanding of the topic, compare previous findings, identifying knowledge gaps that demand further investigation, to critique existing findings and identify potential areas for further studies. This chapter, therefore, aims to provide an understanding of project management controls within the project cycle, how capital projects are implemented, and the difficulties of project management in the public sector while critiquing previous studies to justify the current research. The researcher reviewed the following subject areas: Capital Projects Implementation and challenges generally, Challenges of capital Project Management implementation in the public sector, and the development of the research conceptual framework through the analysis of the project management control theory.

2.2 CAPITAL PROJECTS IMPLEMENTATION

Investopedia (2014) defines capital projects as undertakings which require the use of notable amounts of capital, both financial and labour, to undertake and complete. According to PriceWaterHouse Coopers (2009) capital projects are not part of day-to-day operations also the magnitude of such projects presents massive challenges at the best of times. Price Waterhouse Coopers (2013) also provide a typical construction capital project cycle shown in Figure 2.1 overleaf.

2.2.1 Characteristics of Capital Projects

Table 2.1 below shows the characteristics, and implications/challenges, of capital projects.

Table 2.1: Characteristics of Capital Projects

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Implications/Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size: Large-scale</td>
<td>🌈 Huge resource requirement (labour, equipment, financial etc)</td>
</tr>
<tr>
<td></td>
<td>🌈 Multiple stakeholders</td>
</tr>
<tr>
<td></td>
<td>🌈 Large volumes of information input &amp; output</td>
</tr>
<tr>
<td></td>
<td>🌈 Logistics planning essential</td>
</tr>
<tr>
<td></td>
<td>🌈 Strong governance structure required</td>
</tr>
<tr>
<td>Capital Intensive</td>
<td>🌈 Financiers need strong and continuous business justification to commit to projects</td>
</tr>
<tr>
<td></td>
<td>🌈 Huge contributors to a country’s GDP therefore failure of</td>
</tr>
</tbody>
</table>
The risk of loss of such huge investment on capital project execution makes success critical. As a result endeavours have been made into understanding the challenges and success factors in capital project implementation. These factors are stated in sections 2.2.1.1, 2.2.1.2, and 2.2.1.3 of this chapter.

2.2.1.1 Challenges facing Capital Projects

In 2012 Accenture, a project management consultancy group, conducted a global survey on effective delivery of capital projects. In the research Accenture came up with most notable challenges faced by capital projects whether in the public or private sector and are shown in Figure 2.2 below.

| Complex | Requires talent/skilled labour which is scarce & expensive |
|         | Requires extensive investment in, and use of, specialised software |
|         | Highly risky as risk increases with complexity of project |
|         | Comprehensive planning required for implementation |

Source: Culp (2012)

**Main Challenges in Capital Project Implementation**

- Special interest opposition: 45%
- Access to financing/local joint venture partners: 37%
- Workforce/Skills availability: 11%
- Regulatory requirements: 7%

*Figure 2.2: Most Notable Challenges in Implementing Capital Projects, Accenture (2012)*
From Figure 2.2, the main challenge in capital project implementation is opposition from interest groups followed by regulatory requirements. These are major concerns in the energy and mining sectors, in which the Accenture survey was conducted. Such opposition and regulatory requirement may not exist to the same extent in the construction industry.

Accenture also noted other challenges which are listed below in descending order of impact:

- Original assumption proven to be incorrect/incomplete
- Unforeseen contractor/supplier constraints
- Availability of talent resources
- Poor controlling management
- Changes to budget
- Poor productivity
- Transitions from project teams to operations are problematic
- Decision making and IT support need improvement

As mentioned in Chapter 1 of this research, the Accenture survey was conducted in developed countries and as such the challenges observed may not reflect challenges faced by lesser developed countries in their implementation of capital projects. Section 2.2.1.2 below looks at challenges faced in developing countries.

### 2.2.1.2 Challenges faced by less developed countries in capital project delivery

Youker (1992) cited by Ali (2010) indicated that project success, or failure, of many World Bank development projects in developing countries depends on factors in the general environment which are outside the direct control of the project manager. Some of these challenges faced by developing countries are listed below (Ali, 2010):

- A shortage of local funds that the government has promised for the project hence projects either do not commence or, they are stopped during implementation
- The inability to hire and retain qualified human resources
- The ineffective transfer of technology and difficulty in building institutional capacity
Difficulties in changing the policy environment
Inadequate accounting, financial management systems and auditing
A shortage of supplies and materials due to overall economic problems

Other scholars such as Galbraith, (1973), Thompson, (1967); Hellsten and Larbi, (2006), Bastani (1998) all cited by Ali (2010), also describe how environment conditions affect project success. Such conditions include uncertainty, complexity, allocation of authority, availability of resources, traditions, norms, values, and procedures. PMI (2004) recommends special consideration be given by the project team to understand the socio-cultural, economic and political environmental of the project and the country when implementing projects (Ali, 2010).

2.2.1.3 Success Factors for Capital Projects:


“... being on time, on budget, of quality ... are the most important factors for successful capital project management,...” - Richard Wilkes, 2012, Interview with Kennedy

These variables (also known as the triple constraint variables) however, are affected by other variables such as resources, planning, and risk. In 2012 Kennedy, a contributing editor to the Plant Service Journal, identified eight (8) factors for successful capital project implementation the main ones being astute planning, structured controls, and a culture of effective project delivery. Also in 2012 Accenture’s global survey came up with a list of key attributes in successful capital project delivery which include comprehensive and rigorous planning at the early stages of the project (also known as frontend loading), high quality risk management and procurement strategy, developing and retaining talent, and improving the transition from the construction phase to a producing asset. The success factors for capital projects are described in Table 2.2 overleaf.
Table 2.2: Success factors for Capital Projects Implementation

<table>
<thead>
<tr>
<th>Item</th>
<th>Success Factor</th>
<th>Description</th>
</tr>
</thead>
</table>
| 1    | Pre-planning (also known as ‘front-end loading’)        | • This is where the vision is transformed into realizable goals, taking numerous and wide-ranging considerations into account.  
• Planning should be consistent and aligned with business goals  
• Each capital project has unique attributes and numerous challenges necessitating the need to perform a thorough assessment of each project ensuring that processes and specific actions are considered from the very beginning to account for these specificities (Glenn Kmecz, 2012)  
• Factors to be considered include technology selection, contractor selection, government permits, materials sourcing, operations readiness, and environmental impacts, to name a few.  
NB: The ability to influence project success is greatest at the start of project evaluation and rapidly declines as a project advances towards implementation. Therefore the quality of decision making in the early stages is a critical factor in project success (Kennedy, 2012, Accenture, 2012, and Culp, 2012). |
| 2    | Risk planning                                           | • Risks are best mitigated by recognizing them upfront and managing them throughout the entire project life cycle (Kennedy, 2012).  
• Risks typically do not act independently but interact, which is why having extensive cross-functional input is crucial (Accenture, 2012).  
• Organisations need a rigorous approach to capture and assess risks, as well as robust processes for monitoring risks and mitigating them.  
NB: “Companies should put in place processes and analytics that
| 3 | Resource planning | • Kennedy recommends staffing project teams for success.  
   • This includes the establishment of cross-functional project management team. "By having a diverse team, it is more likely that business goals will be met and the project will run smoothly.  
   • Factors to consider include: project team staffing, project office staffing/administrative support, project & office staff equipment requirements, project & office financial resource requirements  
   • Procurement Strategy: Consultants & Contractors must be thoroughly vetted in order to ensure that they will be compliant with the expectations of the owner organization, especially as it pertains to capacity, credibility, safety, health and the environment |
| 4 | Talent Management | • Competing demand for project management talent both inside and outside the industry makes developing and retaining talent difficult  
   • Organisations need to develop a talent strategy early in order to secure the correct staff  
   • Factors to consider include leadership, talent and culture, and organisational structure |
| 5 | Asset integrity planning | • Asset integrity management is a strategy designed to maximise asset reliability, availability and maintainability while protecting health, safety, and the environment.  
   • Capital projects deliver greater savings down the line when operational and asset integrity is addressed at the front end, even at design stage. |
### 5. Expectations planning
- Failure to implement effective AIM has consequences ranging from the extreme (death or injury to personnel or the community) to production losses, work stoppage, plant outages, environmental cleanup costs, fines and legal fees, and damage to the brand and corporate identity, says Marconi.

- This involves managing the expectations of stakeholders through regular communication and updates of the project deliverables.

- Another increasingly prevalent issue in CPM is the lack of consideration of local stakeholders, according to Kmecz. “For multinationals, the manner in which they conduct their business can have a significant impact on the host community,” says Kmecz. “By liaising with external stakeholders and ensuring that their needs are met, it is possible for companies to lower operational costs, solidify cost-effective supply chains, build a highly skilled workforce, ensure a well-maintained infrastructure, and stimulate local economic development. This can become a competitive differentiator and drive sustainable growth.”

### 6. Project structure
- Each project is unique and different from other projects.

- Following a consistent project structure ensures that key steps are not overlooked in the plan. "Without a standard project portfolio management (PPM) tool and corresponding enterprise PPM framework, the success of projects is often determined by the skills and experience of the project manager assigned to the project, which often are individual and not standard. With an enterprise PPM framework and standard tool, it's easier to identify if any process has been omitted." (Nicholson, 2012)

### 7. Project execution
- This involves monitoring day-to-day progress and alerting proper channels when issues arise.

- This allows for timeous mitigation of negative events (Kennedy, 2012)
Gate-keeping should be performed between phases to ensure that all work has been performed correctly before moving forward, otherwise the risk of inflated budgets, long delays and safety or environmental incidents is significantly increased (Kennedy, 2012).

Proactive change management and scope control protects the investment.

Aside from the lack of adequate front-end loading, the most common mistake we have seen is the inability to cope with change once the project is underway, (Kmecz, 2012)

Changes in the project e.g. in scope or personnel made late in projects introduce new risk, which is generally not allocated the same amount of attention as risks that present themselves during the front-end loading stage.

Further, such change can precipitate communication breakdowns, mismanagement and assumptions on progress that are disconnected from reality.

These symptoms of inadequate change management can lead to significant loss of value."

Other success factors emphasised by other institutions include Project Management maturity within the organisation (Ali, 2010), efficient and timely decision making, using an integrated project management methodology, systematic use of key performance indicators (KPIs) to monitor the delivery of capital projects, and increased access to performance data on projects (Curristine, Lonti, Joumard, 2007).

In the end, projects need to be run as high-stakes businesses, with clear objectives and metrics (Accenture, 2012) using comprehensive projects management approaches relevant to delivering high performance. There should also be as little variation as possible from the project plan, as any change can have a ripple effect on the entire project, potentially leading to massive changes and risk in other aspects of the project (Kennedy, 2012).
2.3  CAPITAL PROJECT DELIVERY IN THE PUBLIC SECTOR


- Multiple stakeholders
- Slow/ineffective decision making processes due to hierarchical organisational structure and power distance within public sector organisations
- Political decision making
- Restrictive operation parameters in the public sector that is to say overlapping sets of rules, standards, and processes designed to limit the latitude of public sector employees and do not aid employees in getting things done but to ensure adherence to a consistent standard of behaviour (Profit, August 2009).

2.3.1  Why do public projects fail?

Achterstraat (2013), the Auditor-General of New South Wales (NSW) Australia identified a number of common issues in unsuccessful public sector projects which he grouped into three key themes:

1. poor governance: the lack of independent members to audit government structures and processes. These independent members challenge behaviours and introduce more rigorous approaches to governance issues, thereby challenges issues of lack of accountability and responsibility over project delivery
2. inadequate project management: poor justification for project implementation, little use of participative quality assurance, little use of post implementation reviews to avoid repetition of project mistakes. According to Achterstraat (2013) projects should not commence without a comprehensive cost/benefit analysis, and quality plan. He also mentioned that all too often project teams are more interested in commencing the next project rather than reflecting on
what went right and what went wrong with the project they recently completed, thereby limiting their planning.

3. lack of effective leadership: there is no clear distinction between the person or team that provides the long-term leadership for the project and the team that manages the project. Where one group assumes both roles functions are usually not executed correctly.

Another reason for public project failure is poor task allocation within the government Virgo (2014) which he explains creates lack of ownership therefore noone is responsible for ensuring that the project succeeds. He also notes that there is an absence within central government of incentives and performance management regimes that are geared to motivate those responsible for project success. Virgo (2014) also designates government project failure to the absence of continuity of ownership and management from start to finish due to high rates of 15% staff turnover as few government officials are in the post for more than 18 months.

Having identified general causes for deviancy in the dependent variables, an understanding of reasons for deviancy emanating from the Namibian operating environment will complete the process of identification of possible causes if deviancy in Namibian capital projects.

2.4 THE CAPITAL PROJECT MANAGEMENT PROJECT CYCLE

It is important to have an understanding of how the CPM division undertakes is project delivery process by looking at their project cycle. Figure 2.3 overleaf shows the cycle for implementation of public projects in Namibia.
The project cycle in Figure 2.3 above is very similar to the generic cycle as shown in Figure 2.1 published by Price Waterhouse Coopers. However, the DOW is involved only in the project implementation stage which consists of the preparation of technical documentation, tendering and procurement, and construction.

The technical documentation involves the preparation of contract documents including service contacts for consultants, construction contracts and procurement documents, and funding documentation.

The Tendering process is the act of bidding where contractors submit their bids for executing the work, the bids are evaluated and one contractor awarded the project.

The Construction process is the physical erection of the planned buildings/structures in accordance to the contract documents.

Though the project CPM cycle is similar to the generic cycle there are some limitations as it the CPM cycle only begins after project initiation and ends at project immediately after implementation.
2.5 PROJECT MANAGEMENT CONTROLS

2.5.1 The Project Management Control Theory:

According to Project Controls can be defined as management action, either pre-planned to achieve the desired result or taken as a corrective measure prompted by the monitoring process (www.projectcontrolsonline.com, 2012). However the theory of project management control is a portion of the wider theory of project management. According to Koskela and Howell (2002) the underlying theoretical foundation of project management as espoused in the PMBOK by PMI and applied in practice is divided into the following:

- The theory of project where project is conceptualised as transformation of inputs into outputs, and
- The theory of management which consists of planning, execution, and control

Two types of underlying theoretical foundations exist pertaining to the theories of project and management namely the conventional theory, which has been found obsolete by researchers Koskela and Howell (2002), and the competing theory which was found to be more accurate and more relevant for use today (Appendix 2.3 shows the Conventional Project Management Theory and its assumptions which have been found deficient). Table 2.3 overleaf describes the ingredients of the competing underlying theory of project management.
From Table 2.3 there two underlying theories of project management control namely the thermostat model (which has been argued to be obsolete), and thermostat control + scientific experimentation model (Koskela and Howell, 2002). According to Koskela and Howell (2002) the thermostat model consists of measurement of the realisation rates of project tasks and alerting the project team of deviancy; whereas the competing theory control consists of measurement of the realisation rate of project tasks, and investigating causes for deviancy then elimination of those causes. The latter is argued to be a more accurate representation of current project management practice by researchers Koskela and Howell (2002).

According to www.projectcontrolsonline.com (2012) project controls are mainly concerned with the metrics of the project, such as quantities, time, cost, and other resources; however, project revenues and cash flow can be part of the project metrics under control.
2.5.2 Types of Control Tools

Various controls, tools and techniques exist to ensure that a project is delivered on track, time, and within budget. These tools and techniques are embedded in and linked to the stages in the project cycle (Business and Innovation Skills, 2010). Figure 2.4 below shows the traditional project cycle. Items 2.5.2.1 in this section identify the construction controls at each stage and Appendix 2.4 describes the construction control tools in detail.

![Project Cycle Diagram](image)

Figure 2.4: The Project Cycle, Adopted from PMI (2013)

2.5.2.1 Construction Project Control Tools

Table 2.4 overleaf shows the construction control tools at each stage of the project cycle and the variables that are controlled by such tools. For detailed description of the control tools please see Appendix 2.4.
Table 2.4: Construction Control Tools at each Project Cycle Stage

<table>
<thead>
<tr>
<th>Project Stage</th>
<th>Control Tool</th>
<th>Variable under control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Initiation</td>
<td>Project Charter</td>
<td>Project quality &amp; scope,</td>
</tr>
<tr>
<td>Project Planning</td>
<td>Front-end Loading, Adoption of Best Practices of Project Management e.g. PMBOK, PRINCE2, PRiSM, Last Planner</td>
<td>Project time, Project cost</td>
</tr>
<tr>
<td>Project Implementation</td>
<td>Programme of Works, Project Budget, Quality Plan, Supervision, Project Meetings, Document Control</td>
<td>Project Time, Project Cost, Project Quality, Project Scope</td>
</tr>
<tr>
<td>Project Closure</td>
<td>Testing &amp; Commissioning, Final Inspection, Final Accounts, Document Control</td>
<td>Project Quality, Projects Cost</td>
</tr>
</tbody>
</table>

2.5.2.2 Factors affecting appropriateness of controls for organisations

As mentioned earlier, controls have to be selected and adapted to suit the peculiar needs of a project. The main factors that determine the appropriateness of control tools are classified by Duncan (1995) as project related, organisation related and people related. The individual factors are shown in Table 2.5 below.

Table 2.5: Factors Affecting Project Control Appropriateness on Projects

<table>
<thead>
<tr>
<th>Factor Class</th>
<th>Individual factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project related</td>
<td>Project metrics such as project size, project complexity, resource requirement</td>
</tr>
<tr>
<td>Organisation Related</td>
<td>Organisational structure, culture, management style, number of projects the organisation engages in, public or private organisation, Project Management Maturity</td>
</tr>
<tr>
<td>People Related</td>
<td>Skills</td>
</tr>
</tbody>
</table>
2.6 CRITIQUE OF PREVIOUS LITERATURE

Having reviewed past literature on how capital projects are implemented and the challenges particular to them, the researcher noticed the following deficiencies in the literature.

2.6.1 Critique on Capital Project Implementation:

Price Waterhouse Coopers (2013) defined the capital project cycle as having four stages with different sub-stages as shown in Figure 2.5 below.

![Figure 2.5: Price Waterhouse Coopers’ generic construction project cycle](image)

The above project cycle differs from the CPM project cycle in that the CPM project cycle commences at Project Development and ends at the completion of Project Execution. The User-Ministries are responsible for the Project Appraisal & Project Operation stages. Also if the CPM project cycle is analysed as its own separate subset of the entire project cycle, the processes of business strategy, stakeholder analysis, and project optimisation are not a part of the cycle. As a result, the DOW is limited in its technical contributions to the Project Development and Project Execution stages. The generic project cycle therefore does not fully apply to the CPM division.
2.6.2 Critique on Challenges in the implementation of capital projects

As mentioned in Chapter 1 of this dissertation, most of the studies pertaining public infrastructure development were conducted in developed countries with therefore limited The Accenture global survey in 2012 revealed the biggest challenge in the implementation of capital projects was special interest opposition, and the second being regulatory requirements which are largely Environmental laws. Special interest opposition is experienced largely at the project appraisal stage which is outside the CPM project cycle. Therefore this challenge does not apply to CPM and its project management framework. Also in Namibia the Environment Management Act (EMA) was only passed in 2007. As such the full operation and operational development is still in its early stages as evidenced by the recent publication of the EMA Regulations in 2012 which “operationalise” the Act (Mashauri and Kgabi, 2014). The regulatory framework that largely affect capital projects implementation are the Tender Board Regulations. These however only affect the procurement stage and are not a significant hindrance in the capital projects. Access to skills and financing however seem more applicable to CPM project implementation. This justifies the current study as prior literature only applies to a limited extent to the Namibian situation.

Achteerstraat (2013) said that the three reasons for poor project delivery are poor governance structures, inadequate project management and inadequate leadership. Again his study was conducted in a first world operating environment which greatly differs from the Namibian operating environment. Hence this literature may not be applicable in Namibia.

2.6.3 Critique on Success factors for Capital Projects

Kennedy, (2012), Accenture, (2012), and Culp, (2012), in their respective studies, concluded that the ability to influence project success is greatest at the start of project evaluation and rapidly declines as a project advances towards implementation. Therefore the quality of decision making in the early stages is a critical factor in project success. However, the CPM project cycle only begins after the Project Appraisal stage thereby constricting DOW’s technical involvement to project development and execution stages. A process of identifying the success factors specific to the Namibian public sector will have to done.
2.7 THE CONCEPTUAL FRAMEWORK

Maxwell (2004) quoting Miles and Huberman (1994) defined a conceptual framework as a visual or written product that explains, either graphically or in narrative form, the main things to be studied and the presumed relationships among them.

The variables under study in this research are the project metrics on which controls are implemented, namely time (schedule), cost, and quantity (scope) shown in Figure 2.6 below.

![Figure 2.6: Variables of the research, Adopted from Watt (2013), Project Management, PressBooks.com](image)

The variables however are dependent on a lot of other factors termed independent variables. The relationship between the variables shown in Figure 2.6 above and the independent variables is in Table 2.6 below.

**Table 2.6: Dependent and Independent Variables of Project Controls**

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Independent variables</th>
<th>Relationship</th>
</tr>
</thead>
</table>
| Project Quality(Scope) | ● understanding client requirements,  
● skill & (experiential) knowledge to produce the product  
● tests, correction and commissioning  
● supervision  
● Unforeseen conditions | ● Positive correlation exists  
● Positive correlation exists  
● Positive correlation exists  
● Positive correlation exists |
2.8 CHAPTER CONCLUSION

In this chapter the relevant ideas and literature on how capital projects are implemented, and the challenges they face in both the developed and developing world were reviewed. The gaps in the literature namely the inapplicability of the project cycle to the CPM project cycle, the fact that most of the prior research was conducted in environment different from that of Namibia made application of foreign control systems inappropriate to the Namibia situation thereby justifying the present study. Further to this, the underlying theory of project management controls was defined as being part of the larger theories of project and management, with project being conceptualised as transformation of inputs to outputs, flow, value generation; and management being conceptualised as planning, execution and control. The theories pertaining to project controls were defined as the thermostat model, which strictly measures deviancy from the plan and alerts the project team, and the scientific experimental model which in addition to measurement of deviancy seeks to eliminate causes of deviancy. The variables of the current study were defined as time/schedule, quality/scope, and cost/resources – also defined as the triple constraints. The relationship between these variables and their independent variables were all found to be positively correlated.
CHAPTER 3: METHODOLOGY

3.1 INTRODUCTION

In order to pursue the research objectives highlighted in Chapter 1 of this research, the researcher had to gather data primarily from the personnel in the public sector namely personnel from Capital Projects Management, and from the Maintenance Division. The researcher also proceeded to obtain some information from the private consultants with whom the Capital Projects Management division are engaged.

This chapter details how the researcher conducted the data collection process and highlights aspects of the research design, definition of the target population and how the research sample was obtained, selection of data collection tools, and limitations experienced by the researcher during the data collection process.

This chapter also gives a brief plan of the how the researcher proposed to present his data in the Data Presentation and Analysis chapter of the research.

3.2 RE-CAP OF THE RESEARCH PROBLEM

This research is concerned with the successful delivery of Namibian public capital construction projects in the aftermath of the secondment of substantial numbers of construction personnel to Namibia by the Republic of Zimbabwe. The current control system in use at the Capital Project Management division, the division responsible for the delivery of public capital projects, is though functional but still riddled with project over-runs which have caused dissatisfaction within the government with the Department of Works. This research therefore emphasises on the need for effective project controls without which it will be difficult to deliver Namibia public capital construction projects on time, on budget, and with required features and functions.

3.3 METHODOLOGICAL FRAMEWORK

The researcher triangulated qualitative and quantitative research tools during the study. Quantitative data was needed mainly as diagnostic tools and as support to the qualitative findings, whilst qualitative data was used to obtained reasons for occurrence particularly on respondents’ perception of the root cause of the
challenges in the operations of the Capital Projects Management/Department of Works (CPM/DOW) division.

Both secondary and primary data were obtained. A number of methods of data collection, for the collection of secondary and primary data, were used. The type of data collected includes primary data from site visits and meeting minutes. Primary data as also obtained from surveys by use of questionnaires, a focus group discussion, and from interviews with respondents. The researcher was unable to conduct more than one Focus Group Discussion which would have been useful in the extraction of “consensus data” with regards the challenges and root-problems at the Department of Works, and proposed solutions to combat such problems.

3.4 SUBJECTS

Subjects are the research participants in this study.

3.4.1 Target population

Zinyoro (2007), quoting Brett and Khan (1993), defines population as:

“Any group of individuals that have one or more characteristics in common that are of interest to the research”

The target population was identified as construction professionals within the Capital Projects Management and in the private sector who include the following groups:

1. Construction professionals operating within the CPM/DOW division
2. Construction professionals in the private sector with whom the CPM/DOW division has worked with on public projects

3.4.2 Justification of Target Population:

Only the above mentioned people groups were targeted as the sampling frame because the researcher needed subjects with experiential knowledgeable in the following areas:
1. Management of construction projects of various sizes within Namibia
2. the operations, processes and management procedures within government organisations

3.4.3 Defined Target population

Of the construction professionals in CPM/DOW division professionals with a minimum professional grade SP3, and who were project coordinators overseeing at least 4 projects were selected as respondents. This is because it is these professionals have a wider knowledge and wider experience of the challenges experienced and have witnessed how these challenges have been resolved.

In the private sector only consultants who were offering their services to more than ten (10) currently running government projects, and consultants who have been appointed on government projects for at least a two years were selected as respondents.

The selection described above was necessary so as to eliminate erroneous variables such as irrelevant and misleading information from inexperienced peoples. The desired target population was those who possessed the relevant information that the researcher required.

3.4.3.1 Location of Population

The samples of project coordinators and CPM management were all located in Windhoek, in the Khomas region/province of Namibia. These professionals were fully capable of giving the appropriate information pertaining to the research based on the following:

1. All the capital projects management staff is located in Windhoek the majority of who have travelled across Namibia to monitor implementation of projects
2. In Namibia the majority of professionals in the private sector operate from Windhoek in the Khomas Region. These are the same who are appointed to be consultants on projects in the various regions/provinces within Namibia
Due to the above the researcher felt no need to include the few consultants who operate from outside the Khomas region.

3.5 SAMPLING

The researcher used both probability and non-probability sampling methods. Figure 3.4.1 below is a summary of the sampling methods used and the weighting of each method in the research.

![Sampling Methods Diagram]

Figure 3.4.1: Sampling Methods used by Researcher

From Figure 3.4.1 it can be seen that purposive sampling was used to a greater extent compared to random sampling. This is largely due to the requirement for experiential knowledge from the respondents so as to reduce the margin of error in the study.

3.5.1 Project coordinators sampling:

Probability Sampling:
The stratified random sampling procedure was used by the researcher as follows:

Project coordinators were grouped into 4 different strata based on the zones in which they operate. There are 4 different zones in the capital project management division.
namely Zone 1, Zone 2, Zone 3 and Zone 4. Each zone handles projects for a certain group of user ministries. For example Zone 1 oversees projects which are security related i.e. construction of prisons, police stations, home affairs whereas zone 3 handles projects that are mostly administrative in nature i.e. facilities for the presidential and prime ministerial purposes.

**Non-Probability Sampling**

Upon grouping the coordinators into strata, the researcher then used purposively sampling. Selection of respondents amongst the CPM management was done on purposive sampling based on the criteria described in section 3.3.3 of this chapter.

For selection of respondents amongst consultants purposive sampling was the only sampling methods used based on the number of public projects the consultants had done handled. These statistics were obtained from the performance evaluation reports produced by the Department of Works each financial year.

**3.5.2 Consultants sampling**

Consultants were divided into two strata namely Architects and Quantity Surveyors who are the two professions normally chosen to head consultant project teams, and are therefore the most experienced in terms of project management.

For each stratum the researcher calculated sample size was determined as follows:

\[
\text{Stratum sample size determination } \quad n = \frac{z^2 pq}{e^2}
\]

Where:

- \( n \) = sample size
- \( z \) = standard normal deviation at 95% or Confidence Interval of 1.96
- \( p \) = proportion of the population with desired characteristics (firms with more than 10 public projects in their office and appointed on government projects for at least 2 years)
- \( q = 1-p \)
- \( e \) = maximum allowable error set at 0.05
The researcher then used simple random sampling to select the individual firms for the purposes of the research. Within each selected firm, purposive sampling was used to select the individual respondents, that is to say only consultants who had experiential knowledge of public projects management.

### 3.5.3 The sampling frames

The researcher considered the maximum number of professionals because the nature of information required by the researcher needed to be supported by statistics. Most information was managerial in nature and hence required a second opinion. Table 3.5.1 below summarises the sampling frame for the research.

<table>
<thead>
<tr>
<th>Name of Organisation</th>
<th>Strata</th>
<th>Sub-Strata</th>
<th>Number</th>
<th>Total Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Project Management:</td>
<td>SP3</td>
<td>Zone 1</td>
<td>12</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Zone 2</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Zone 3</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Zone 4</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Project coordinators</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private sector consultants (Principal agents only)</td>
<td>Architects</td>
<td></td>
<td>33</td>
<td></td>
</tr>
<tr>
<td></td>
<td>QS firms</td>
<td></td>
<td>24</td>
<td>57</td>
</tr>
</tbody>
</table>

Table 3.5.1: Sampling Frame

From Table 3.5.1 above the sampling frame was relatively large totalling 92 respondents.

### 3.6 RESEARCH INSTRUMENTS

The researcher used both survey and non-survey methods to acquire holistic data. The data collection methods are shown by Figure 3.6.1 overleaf and described in more detail in sections 3.6.1 and 3.6.2 of this chapter.
Figure 3.6.1: Data Collection Methods used by researcher

3.6.1 Survey Methods: Primary Data

The use of surveys is an indirect approach to gathering data (Chipungu, 2007). The researcher gathers use of phenomena through people who give him/her the information. It is more appropriate for collective/community and social types of research work and hence their appropriateness for the administrative portion of this research. The survey tools used were:

1. **Interviews**
   
   a) **Open ended Interviews**

   In this type of interview is also an in-depth interview where the general course of the interview is pre-determined however the wording of questions is not pre-determined. This gave the interviewer more freedom of movement in interviewing. This interview was used for probing and when the researcher sought clarity on specific responses to questionnaires submitted to project coordinators and consultants.

2. **Questionnaires**

   All questionnaires administered both open ended and closed ended questions (see Appendix 3.1). Closed quantitative questions are those where by both
the questions and answers are pre-determined. The responses are fixed, that is, the respondent chooses from among given responses. In open ended questions the responses are not pre-determines and thereby give the respondent freedom to give explanations, views and opinions. Apart from enabling the acquisition of quantitative data, this type of questionnaire enabled the researcher to obtain qualitative data from the project coordinators within a shorter period of time in comparison to time that would have been used interviewing each project coordinator and each consultant.

3.6.2 Non-survey methods

Non-survey methods are the more applicable methods in the built environment because there is more direct contact with the phenomena.

1. Observation

This is defined as purposive and selective watching and counting of phenomena as they take place (Chipungu, 2007). It was useful in gathering information pertaining to the nature of management style in the CPM division, project management practices within the CPM Division, and the culture of project delivery within the CPM division. As a method of data collection, observation is very valuable where the researcher is assessing physical and societal phenomena.

2. Documentary Evidence

Documentary Evidence is of two types; continuous records that show permanent evidence, and discontinuous records that provide evidence at a particular time. The existing documents considered came in the form of institutional records i.e. project and management minutes at the CPM division, and yearly reports on projects delivered per year. The researcher made sure to use documentary evidence strictly for the years 2010 – 2013 to prevent use of information that is out of date and not suitable and henceforth misleading for the current purpose.
3.7 DATA PRESENTATION PLAN

Data will be presented and analysed in the form histograms, and pie charts written text for quantitative data, and textual tables for qualitative data to present and analyse data in Chapter 4 of this research.

3.8 LIMITATIONS TO THE STUDY

The researcher experienced limitations during the research in the form of:

- Lack of capacity to conduct more focus group discussions with the construction professionals who are not project coordinators. To compensate for this shortcoming the researcher engaged in interviews with the said professionals.

- No data could be captured form project coordinators of security sensitive projects and as such these projects were excluded from the survey. Whilst every effort was made by the researcher, and successfully so, to add more projects from non-security sensitive ministries to make up for numbers, data on project management controls peculiar to security sensitive projects could not be obtained.

- The study is based on a case study of one public department in one ministry in Namibia, therefore generalisations to public institutions in all Namibian public institutions might prove erroneous.

- This research uses only PMI Best Practices as a benchmark for analysis and excludes other Best Practice approaches.

3.9 CHAPTER SUMMARY

This chapter has focussed on the important task of how the researcher carried out the data capture phase of the research highlighting all special requirements and limitations experienced during the study.
CHAPTER 4: DATA PRESENTATION AND ANALYSIS

4.1 INTRODUCTION

This chapter aims to present and analyse data that as gathered through questionnaires, interviews, and observation. The purpose of data presentation is to enable analysis of such data and hence facilitate the drawing of conclusions in an attempt to satisfy the research aim. Effort was put to provide a comprehensive and all-inclusive report on the research findings.

4.2 DISTRIBUTION OF RESPONDENTS

Table 4.2.1: Distribution of Respondents

<table>
<thead>
<tr>
<th>Respondent</th>
<th>Total Population in survey</th>
<th>Percentage of Total Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project coordinators</td>
<td>23</td>
<td>59%</td>
</tr>
<tr>
<td>Consultants</td>
<td>16</td>
<td>41%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>39</td>
<td>100%</td>
</tr>
</tbody>
</table>

The quality of respondents can also be classified according to the type of information given by the respondents.

4.3 RESPONSE RATE

The overall response rate was satisfactory especially for data gathered by questionnaires as shown in Figure 4.2.2 overleaf with a response rate of 60%. Albeit being the slowest data collection tool used responses were comprehensive, coherent and showed a general pattern of the root cause of the inefficient delivery of projects at the CPM division. The response for interviews was less satisfactory with fewer scheduled interviews being conducted. The response rate is broken down in Table 4.2.2 below.

Table 4.2.2: Response rates

<table>
<thead>
<tr>
<th>Data capture tool</th>
<th>Respondent</th>
<th>Response rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questionnaire</td>
<td>Project Coordinators</td>
<td>60.1%</td>
</tr>
<tr>
<td></td>
<td>Consultants</td>
<td>31.3%</td>
</tr>
<tr>
<td>Interviews</td>
<td>Project coordinators</td>
<td>33.3%</td>
</tr>
<tr>
<td></td>
<td>Consultants</td>
<td>18.8%</td>
</tr>
</tbody>
</table>
As can be seen from Figure 4.2.2 the consultants’ response rate is approximately half of that of the CPM/DOW officials. However, consultants were included to remove bias that may arise from obtaining data from one party -CPM/DOW. However upon analysis of responses it was found that most of the responses, from both the CPM/DOW project coordinators and consultants, were similar. Therefore the response as shown in Figure 4.2.2 was satisfactory as no new information was coming from the respondents.

4.4 VALIDITY AND RELIABILITY OF DATA

4.4.1 Primary

a) Data gathered from Survey methods

Table 4.4.1 below shows the data collection tools for each type of respondent.

<table>
<thead>
<tr>
<th>Data collection tool</th>
<th>Type of respondent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questionnaire</td>
<td>Project coordinators &amp; Project Consultants</td>
</tr>
<tr>
<td>In-depth (interview guide)</td>
<td>Purposively Selected Project coordinators &amp; Project Consultants</td>
</tr>
</tbody>
</table>

As can be seen from Table 4.4.1 each survey research tool was used on both groups of respondents, the questionnaire as the first data collection tool followed by the in-depth interviews for deeper understanding of questionnaire responses. As mentioned in Chapter 3 of this dissertation, respondents selected were professionals with experiential knowledge in the subject in question. The researcher did a study into the quantum of experience of the proposed respondents before administering questionnaires and conducting interviews.

b) Data gathered from non-survey methods

Table 4.4.2 overleaf shows the data collection tools for non-survey collected data and the source of information upon which the tool was used.
Table 4.4.2: Tool-Information Source Matching

<table>
<thead>
<tr>
<th>Data collection tool</th>
<th>Information Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation</td>
<td>Site Visits, Project Meetings</td>
</tr>
<tr>
<td>Minutes of Meetings</td>
<td>Purposively Selected Project coordinators &amp;</td>
</tr>
<tr>
<td></td>
<td>Project Consultants</td>
</tr>
</tbody>
</table>

4.5 RESEARCH RESULTS

The questionnaires prepared were very direct and demanded specific information from the respondents. The researcher piloted the questionnaire amongst selected professionals (4 project coordinators) to test for coherency and complexity before administering such questionnaires.

A) Number of projects analysed in study

![Figure 4.5.1: Distribution of projects analysed in the survey amongst CPM professionals](image)

As shown in Figure 4.5.1 the largest portion of projects in the survey were mid-sized projects which, according to Namibian Tender Board regulations is designated to 100% owned Namibia contractors. These comprised 40% of the surveyed projects. The second largest in numbers were followed by projects with a value below N$20 Million which comprised 37% of the surveyed projects. Such projects are designated to SME contractors. Lastly, the smallest portion of projects in the survey were projects with a value above...
N$60 Million comprising 23% of the total survey. These are designated to any contractor though preference is given to firms with at least 51% Namibian ownership.

**B) Status of Success Rates of Projects implemented by CPM/DOW:**

The measurement of current deviancy in the triple constraint variables on CPM projects is shown in Figure 4.5.2 overleaf. The figure measures deviancy for the three sizes of projects undertaken by the CPM/DOW thereby analysis the relationship between project size and project success at CPM/DOW.

![Figure 4.5.2: General Success Rates of Capital Projects at DOW](image)

**Figure 4.5.2: General Success Rates of Capital Projects at DOW**

**NB: PLEASE READ APPENDIX 4.1. IT SHOWS INTERVIEW FINDINGS WHICH GIVE REASONS FOR THE STATUS OF PROJECT SUCCESS AT CPM/DOW.**

**Analysis**

Figure 4.5.2 shows that completion within schedule is a bigger challenge for small and mid-sized projects compared to completion within budget, with success rates of 21%, and 38% respectively for completion within time compared to 58% and 48% for completion within budget. Only in large projects is completion within schedule above...
50% (at 58%), and higher success is experienced for completion within schedule compared to completion within budget which is at 50%. The average success of the projects increase with project size with small projects having a success rate of 39%, mid-sized projects 43% and large projects 54%.

**Interpretation:**

Generally the average success rate of projects implemented by the CPM/DOW is below 60%. The largest projects (projects with a value above N$60Million) have highest average success rates in terms of execution on time and budget whilst the smallest projects (projects with value of less than N$20Million) have the least success average success rate. This is at odds with Stuckenbruck and Zomorrodian (1987) observation that developing countries are challenged primarily in the execution of large and mid-sized projects. In Namibia CPM division is challenged with the execution of small and mid-sized projects.

**Explanation of results (Why do the smaller projects fail whilst large projects succeed?):**

Interviews, observation and primary data of meeting minutes (See Appendix 4.1 for detailed findings) revealed the following explanations for the observed project success pattern:

- Difference in the calibre of contractor procured for small projects vs contractor for large projects:
  According to the Namibia Tender Board regulations (shown in Table 2.2), all projects with a value of less than N$20Million are reserved for SME contractors, and mid-sized projects (N$20Mil – N$60Mil) are reserved for 100% Namibian companies in a bid to promote economic development amongst the indigenous Namibian. However, it is this calibre of contractors who currently have the least capacity in terms of technical and managerial skills. Their levels of competence with regards project management are therefore much lower compared to those of larger more experienced contracting firms. Projects with a value above N$60Million are considered complex and resource demanding and are therefore open to all size contractors – Category A to Category H (See Appendix 2.2 for categories
detail). Usually category D–H contractors are not procured for the large projects as they are beaten by Category A–C competition, who have more technical and managerial capacity and construction experience.

- Political Appointment of Contractors for small and mid-sized projects: The tender evaluation and ultimate appointment of contractor and consultants is sometimes manipulated and results in the appointment of consultants and contractors not on a basis of merit, but on the basis of “who-knows-who”. These appointees become “sacred cows” who are untouchable and often choose to **NOT** to adhere to the contract and suffer no repercussions because they have recourse in high offices.

In terms of Budget Control it is the smallest projects that have the highest success in terms of completion within budget with a success rate of 58%. In second place are the largest projects with a success rate of 50%, and lastly the least successful in budget control are the mid-sized projects. (Results on budget control are discussed in section D of this chapter)

In terms of completion within schedule the largest projects have a 58% success rate, which is the highest success rate. The mid-sized projects are completed being completed with a 38% success rate, and the smallest projects have the least success rate of 21%. To understand the reason for this scenario (small success in completion within schedule) it is needful to look at the causes of delay and the causes of success in terms of time, and budget.
C) SCHEDULE CONTROL

Causes of project delays:

![Graph showing sources of project delays]

**Sources of Project Delays**

- User-Min. Issues: 19%
- DOW issues: 12%
- Consultants issues: 23%
- Contractor issues: 25%
- Market related issues: 12%
- Genuine unforeseen events: 10%

**Figure 4.5.3: Sources of Project Delays**

**Analysis:**

The three major causes of project delays arise from the contractors who contribute 25% of the delay, the consultants who contribute 23% to the delays, and the User-Ministries who contribute 19% towards project delays. The DOW, Market and unforeseen events contribute minimally to project delays compared to Contractor, Consultant and User-Ministry issues.

**Interpretation:**

The causes of delays from the theory of management are an indicator of lack of management planning and management organising. From the results in Figure 4.5.3 therefore indicate lack of management skill in the contractor’s camp, with the head of the consultants’ team - the Principal Agent (PA), and lack of planning and organising skill with the user-ministry.

The results in Figure 4.5.3 are in line with Accenture’s 2012 global survey which shows the major contributor to project delays as contractor/supplier constraints. An
understanding of the reasons for contractor, consultant and user-ministry contributions to project delays is given in Figure 4.5.4 – Figure 4.5.6. Figures 4.5.7 – 4.5.9 show the specific sources of delay from the DOW, market and unforeseen conditions.

C1. Contractor Delays

Contractor delays contribute 25% of project delays. This 25% is broken down as shown in Figure 4.5.4 below.

**Figure 4.5.4: Delays Caused by Contractor**

**Interpretation:**

Poor planning and coordination of work was found to be the largest attributor to poor schedule performance, contributing to 15% to total delays (or 58% of just the Contractor’s delays) which is in line with the theory of management. This is a direct indicator of the absence of management planning and management organising in the contractors’ camps. Limited capacity in terms of human, technical and financial was the second biggest cause of project delay in the contractors’ camp responsible for 6% of the total delays. Of less significance were delays caused by correction of defective work/remedial work and refusal or failure to follow the Principal Agent’s instructions, both contributing 2% to the overall causes. This indicates the existence of technical competence amongst contractors (from SMEs to large contractors).
What may be missing is the managerial and planning competence resulting in poor planning and poor coordination of work.

C2. Consultant Delays

The second biggest cause of delay is the consultants procured for design and supervision of government projects who contribute 23% of the delays. Specific delays emanating from the consultants are shown in Figure 4.5.5 below.

![Consultant causes (%)](image)

**Figure 4.5.5: Delays caused by Consultant**

10% of all delays are caused by poor co-ordination amongst consultants and a principal agent’s inability to manage his consultants and the project. Another word for coordination is organisation, indicating the absence of management-as-organising in the consultants team. This poor coordination could be a result of misunderstanding pertaining the principal agent’s (PA) roles and responsibilities. From interviews with sampled Project Coordinators, and separately with Principal Agents, it was revealed that there is a mis-match between CPM’s expectations of the PA function, and the PA’s understanding of his function. Both parties’ definitions of the PA role are compared against what the government gazette No. 250 defines as the PA role in Table 4.5.1 overleaf.
Table 4.5.1: CPM-PA mis-understanding on roles and responsibilities

<table>
<thead>
<tr>
<th>CPM Expectation</th>
<th>PA Understanding</th>
<th>Government Gazette</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coordinate all consultants work</td>
<td>Coordination of designs by consultants, though design mis-match are largely identified by PQS when preparing Bills of Quantities</td>
<td>Silent on the matter</td>
</tr>
<tr>
<td>To ensure consultants execute their duties on time</td>
<td>Notify CPM of consultants' deviancy in the execution of their duties via e-mails, letters, meetings so that CPM can take action</td>
<td>Regular reporting to client</td>
</tr>
<tr>
<td>To ensure contractor follows the programme of works</td>
<td>To report on contractor deviancy via e-mails, letters and meetings so client CPM can take action.</td>
<td>Regular reporting to client</td>
</tr>
<tr>
<td>Change management - monitoring and limiting variations</td>
<td>To report on variations on the project</td>
<td>Regular reporting to client</td>
</tr>
</tbody>
</table>

The CPM/DOW may need to either appoint project managers, or take up the role of project managers to ensure the

The results also show lack of supervision of contractors’ works and consultants delays in exercising their duties each contributes 5% to the project delays. Lastly non-procedural execution of consultants’ works contributes 3% to total delays.

C3. User-Ministry Delays

Third in line are causes from the User-Ministries who contribute 19% to project delays which is broken down into specific causes shown in detail in Figure 4.5.6 overleaf.
The presence of scope creep, the largest portion of the User-Ministry's delays, was discovered to be caused by client poor analysis of both current and future needs, and client change in requirements due to directives from high offices. These results are in agreement with Villanova University's causes of scope creep which are namely, poor requirements analysis, poorly defined project parameters. However other client specific causes listed by Villanova University namely late or none involvement of client in the project, mis-understood and/or uncertain client requirements, underestimating the complexity of the project, unforeseen site conditions, were not mentioned by respondents. Unforeseen site events can be ruled out as major causes of scope creep in this study because this delay factor only contributes minimally to project delays (2%). Delayed payment and/or non-payment to the contractor was also reported to be causing cashflow problems especially for SME and mid-sized contractors who depend on regular payments to proceed with work and is not mentioned in previous literature.

**C4. CPM/DOW, Market & Unforeseen Event Delays**

In the bottom three are delays caused by Department of Works (12%), Market related issues (12%) and unforeseen site conditions/events (10%). The specific causes, each adding up to individual delay contributions to the total, are shown in Figures 4.5.7, 4.5.8 and 4.5.9 respectively.
Figure 4.5.7: Department of Works Project Delays

It is important to note that even though CPM/DOW collectively only 12% to project delays the slow processes contribute 8% to all project delays making DOW slow processes the 3rd biggest cause of delays (tied with unforeseen events). Interviews revealed the following about CPM/DOW operations that cause inefficiencies in its project delivery processes (Please see Table 4.5.2 on page 66 for detailed interview findings and explanations on the items listed below):

- No adoption of coordinated best practices of project management
- Poor human resource management practices/talent management at CPM/DOW
- No continuity of personnel on projects
- Restrictive works parameters
- Poor communication
- Slow/ineffective decision making processes
- Political decision making
- Inadequate Project Management software support
- Bureaucratic red tape at CPM/DOW which causes delays in processes
- Absence of use of key performance indicators
- Poor justification for project implementation presented by User-Ministries
- No documented Client-Consultant Service Agreement
- Use of a failing budget system

Some of the results converge with prior literature namely poor HR practices and inadequate software support were discovered in Accenture’s 2012 global survey as causes of capital project delays. Lack of continuity of personnel was mentioned by...
Virgo (2014), government restrictive work parameters and bureaucratic red tape were highlighted by Wirick (2009), poor justification for project implementation by Achterstraat (2013), and slow and/or ineffective decision making and political decision making were also identified by Ali (2010) as causes of project delays. New items are the lack of coordinated best project management practices, and use of a 3-year budget system that has fallen short on a number of occasions.

Market related issues contributed 12% to project delays which can be broken down as shown in Figure 4.5.8.

![Market related causes (%)](image)

**Figure 4.5.8: Delays caused by Market related issues**

Of note are supplier related items namely supplier monopolies, supplier delays, and distant location of materials show market imperfections that weaken the bargaining power of contractors especially small contractors against such suppliers. Control of these market related causes fall outside the realm of the project manager’s control.
Inclement weather at 8% is a relatively significant cause of delays which again is outside the control realm of the project manager.

C5. Conditions existent that enabled completion within schedule on successful CPM/DOW projects

From the responses in the questionnaires the following were indicated as factors affecting the completion of projects within schedule (See Figure 4.5.10 overleaf):
**Overall Schedule comment:**

The contractor and the consultants are the greatest contributors to schedule success which points to CPM/DOW’s needs to review on its procurement strategy to improve completion of projects within schedule. However, the CPM/DOW is restricted in its procurement strategy for contractors by Tender Board Regulations on all formally tendered projects. As such the next best strategy would be to concentrate on procurement of services from consultants. The CPM/DOW also needs to concentrate on its internal processes which affect 8% of project schedule success.
**D) PROJECT COST CONTROL**

**Causes of project budget over-runs**

![Bar chart showing causes of budget over-runs](image)

**Figure 4.5.12: Causes of Budget Over-runs**

**Interpretation:**

With regards project cost, it is the user-ministry actions that are most significant affecting project cost success by 37%. The second most significant party in this regard are the consultants causing 30% of budget over-runs. Of lesser significance are the CPM/DOW, contractor, and market related issues each contributing 7%, 4% and 4%, respectively. Other issues which jointly contribute 15% are described in section D5 of this chapter.

**Analysis:**

From prior literature, project cost over-runs are an indicator of variations to the projects (Kennedy 2012). Such variations can occur due to scope creep, unforeseen events, or change in user-client’s requirements. The individual causes of each party’s budget over-run contribution are shown in figures 4.5.13 to Figure 4.5.17.
D1. User Ministry Causes of Budget Over-run

The user-ministry contributes 37% to budget overruns which is broken down as shown in Figure 4.5.13 below.

![User-Ministry causes of budget over-runs (%)](image)

**Figure 4.5.13: User-Ministry Budget Over-runs**

The single largest cause of budget over-runs emanating from the user-ministry is scope creep/additional requirements to the additional scope of work. These results converge with Kennedy’s (2012) survey findings that attribute budget over-runs largely to additional work/scope creep. Though scope creep is usually an indicator of poor planning, interview findings in this research showed that poor planning included poor cash-flow planning which led to interest on late payment when the contractor’s payments are delayed.

D2. Consultant related causes to budget over-runs

The consultants 30% contribution to budget over-runs is broken down as shown in Figure 4.5.14.
Consultants’ related causes to budget overruns are more varied with the most significant contributions arising from documentation mistakes, which include design deficiencies, and an unrealistically low budget each contributing 13% and 9% to project budget failure respectively. Change of design specifications and delays in the execution of their duties each contribute 4% to total related delays. Once again these results converge with Kennedy’s 2012 findings as deficient designs lead to variations to the scope of work resulting in budget overruns.

D3. CPM/DOW causes of budget over-runs

Figure 4.5.14: Consultant Budget Over-runs

Figure 4.5.15: CPM/DOW Budget Over-runs
The CPM/DOW contributes 7% to total budget overruns which is broken down as shown in Figure 4.5.15 above. Tender process of the CPM/DOW contributes 5% to budget overruns by way of pre-contract escalations (if the tender process relates to appointment of main contractor), and Extension of Time Claims (if the tender process relates to appointment of sub-contractors). Poor planning (2%) also results in CPM/DOW delays, which has cost implications. As such in its internal processes DOW needs to focus on improving its Tender & tender evaluation processes. Prior literature does not bring out any clear relationship between length of processes and cost over-runs.

D4. Contractor related budget over-runs

![Figure 4.5.16: Contractor related budget over-runs](image)

Figure 4.5.16: Contractor related budget over-runs

Figure 4.5.16 shows that the single delay cause found with the contractors was lack of experience. Through interviews it was found that lack of contractor experience results in poor project planning which leads to unnecessary costs in the project, again indicating lack of managerial skill. The overall contribution to total budget overruns however is minimal, contributing only 4% to total budget over-runs.
D5. Other causes of budget over-runs

The overall contribution of “other causes” to budget over-runs is 15%, broken down as shown in Figure 4.5.17 above with market related escalations contributing 6% to budget overruns, and late appointment of sub-contractors (subbies), contract deficiencies, and delays whose source is unknown each contributing 3%.

As shown in figures 4.5.12 and 4.5.13 the largest contributions to budget over-runs are variations to the original scope of work through user-client additions and variations caused by consultants as they correct deficient drawings. This is in line with Kennedy’s findings that projects should be executed with as little variation as possible from the project plan as any variations can have ripple effect on other aspects of the projects.

D6. Conditions existent that enabled completion within budget on successful CPM/DOW Projects

From the responses in the questionnaires the following were indicated as factors affecting the completion of projects within budget (See Figure 4.5.18 overleaf):
Figure 4.5.18: Factors affecting completion of project within budget

The factors shown above can be grouped to show each organisation's responsibility in the success completion of a project within budget, as shown in figure 4.5.19 below.

Organisational contributions to budget success

Figure 4.5.19: Organisational contributions to budget success
Overall Comment on Completion within Budget

Though Figure 4.5.12 attributes budget over-runs mainly to the user-ministries’ addition requirements, Figures 4.5.18 and 4.5.19 show the main contributors to budget success as consultants’ actions through executing effective change management techniques. Therefore to improve completion of projects within budget, once again CPM/DOW needs to concentrate on its procurement strategy for consultants’ services whilst also limiting scope creep from the User-Ministry. This can be achieved by specific scope controls such as clearly understanding client requirements, designing according to client requirements then as use of freezing documents to prohibit future variations to the design.

E) QUALITY CONTROL

From questionnaire responses the reasons given for client/User-Ministry dissatisfaction with the end-product are given in Figure 4.5.20 below.

![Reasons for Client Dissatisfaction](image)

**Figure 4.5.20: Reasons for Client Dissatisfaction**
Analysis and Interpretation:

The largest cause of client’s dissatisfaction, contributing 40% to project quality, is contractors’ poor workmanship. The second largest cause of client dissatisfaction is changes within client organisations that have led to change in functional requirements of the buildings thus leading to dissatisfaction with the original product as it no longer fits their requirements. This causes 20% of poor project quality. According to interview findings, if the tendering, construction processes take too long, or if the period between signing freezing documents and commencement of construction is too long, client requirements are more likely change in that time, decreasing chances of relevance of the original facilities and functionalities of the building to the end-user. Speed of execution at CPM/DOW is therefore critical for ensuring limited client changes.

Poor design by consultants, malfunction of some facilities, use of wrong materials, and poor needs analysis each contribute 10% to clients’ dissatisfaction.

Prior literature attributes poor quality mainly to poor understanding of the clients’ requirements. The results shown in Figure 4.5.20 are therefore divergent with existing literature as the main cause of poor quality in projects implemented by CPM/DOW poor quality is mainly caused by contractors’ poor workmanship.

Also from the responses in the questionnaires the following (shown in Figure 4.5.21) were indicated as factors affecting the overall quality of projects implemented by CPM/DOW:
Figure 4.5.21: Factors affecting completion of project within quality parameters

From Figure 4.5.21 to combat poor quality an experienced contractor with adequate technical skill is required which would reduce poor project quality by 25%. Apart from an experienced contractor quality control also lies in the hands of the consultants who, through regular supervision of contractors’ work, ensure project delivery within specified quality parameters. Involvement of the user-ministry is the 3\textsuperscript{RD} largest factor that assists quality parameters. Involvement of the user-ministry is the 3\textsuperscript{RD} largest factor that assists quality parameters.

Once again completion of projects quality control lies in the hands of parties external to the CPM/DOW namely consultants, contractor and the user-ministry. To improve the quality of capital projects implemented by the DOW needs to concentrate on the procurement of competent and quality conscious consultants, appointment of technically competent contractors, whilst limiting delays within the tendering process to give less room for changes in user-ministry requirements.
F) CONTROL TOOLS CURRENTLY IN USE ON PUBLIC PROJECTS:

F1. Control tools for managing project time

i. Types of tools in use

![Control Tools Graph]

**Figure 4.5.22: Schedule Control tools in use at CPM/DOW**

ii. Effectiveness of schedule control tools used at CPM/DOW

The effectiveness of the schedule control tools used on CPM/DOW capital projects have an average score of 2.5 on a scale of 1 – 5, where 1 is effective and 5 is ineffective. Appendix 4.2 shows in detail each control tool’s score adding up to the average score.
F2. Control tools for project cost

i. Types & Frequency of use of tools in use

Figure 4.5.23: Cost Control Tools in use at CPM/DOW

ii. Effectiveness of cost control tools used at CPM/DOW

The effectiveness of the cost control tools used on CPM/DOW capital projects is 2.4, on a scale of 1-5 where 1 is effective and 5 is ineffective. Appendix 4.3 shows the score of each control tool and the addition to the average score.
F3. Control tools for project quality

i. **Type & Frequency of Use of quality control tools on CPM/DOW projects**

![Figure 4.5.24: Quality Control Tools in use at CPM/DOW](image)

**Figure 4.5.24: Quality Control Tools in use at CPM/DOW**

ii. **Effectiveness of quality control tools used at CPM/DOW**

The effectiveness of the quality control tools used on CPM/DOW capital projects scored an average score of 2.1. Appendix 4.4 shows the score of each quality control tool adding up to the average score of 2.7.

**Comment**

The project control tools currently in use at DOW are relatively effective with average scores ranging from 2.4 to 2.7 (where 1 is very effective and 5 is ineffective). However these controls are mainly corrective and based on the thermostat model of measuring deviancy and alerting the project team. There is little-to-no evidence of attempts to diagnose the root cause of deviancy and eliminating such causes. In some cases even if the root cause is obvious, little attempts are made to eliminate it...
due to lack of ownership of roles – the CPM/DOW says it is the PA’s responsibility, yet the PA understands it as the CPM/DOW responsibility.

G. INEFFICIENCIES AT CPM/DOW AFFECTING PROJECT DELIVERY

Table 4.5.2 below gives the researcher’s interview findings on the problems project coordinators have seen whilst executing their duties at the DOW.

Table 4.5.2: CPM/DOW Causes of Inefficiencies in Project Implementation

<table>
<thead>
<tr>
<th>Item</th>
<th>Finding</th>
<th>Impact</th>
</tr>
</thead>
</table>
| 1    | No coordinated adoption of project management best practices at CPM/DOW & | 1. DOW engages in limited planning (frontend loading) thereby significantly limiting the chances of project success  
       |                                                                          | 2. Implementation of control tools is as per individual knowledge and experience                                                      |
| 2    | Poor HR Management/Talent Management                                    | 1. Some staff over-burdened with work  
       |                                                                          | 2. No clear guidelines to professionals as to their strategic roles & responsibilities at CPM – Are project managers or just technical advisors for user-ministries? |
| 3    | No continuity of personnel                                             | This affects continuity of ownership and management from start to finish due to high rates and no one then owns the responsibility for project success. This was cited by Virgo (2014) as a cause for project failure in public projects. |
| 4    | Restrictive work parameters to effect change (cited by Wirick, 2009, as a challenge in public sector) | One cannot implement a new control measure until it has been adopted at policy level which takes time |
| 5    | Communication flow within a project team can be unnecessarily long with inaccuracies | There are numerous cases where information lands at the wrong place, or documents are lost, causing delays in CPM/DOW’s internal processes |
| 6    | Absence of project management software support                        | Some believe the use of more technology will enhance operational speed and accuracy                                                  |
| 7    | Hierarchical and bureaucratic Organisational structure resulting in red tape | Affect the decision-making process at the DOW. This type of organisational structure requires a results-oriented management team |
which is effective at decision making. Once an indecisive team is appointed progress is stifled

<table>
<thead>
<tr>
<th>8</th>
<th>Absence of Key Performance indicators within CPM division for personnel</th>
<th>This results in no accountability, slow progress of work within division, and low staff motivation levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>The DOW does not give clear briefs &amp; milestones to its technical staff nor to the consultants describing what they want</td>
<td>A lot of ambiguity exists and there is always need to ask “What do I do now?” or “Where do these papers go to next?” due to the absence of clearly documented operation parameters. This limits operational efficiencies. Both CPM/DOW professionals and Consultants sometimes are unprocedural in the execution of their duties which delays projects as the DOW then has to sanitise/regularise and standardise consultants works before acting upon it</td>
</tr>
<tr>
<td>10</td>
<td>Poor business case for projects; people are more concerned about spending public funds to prevent such funds being returned to the Treasury at the end of the financial year.</td>
<td>Creates an “open cheque” to spend funds without much regard to project budget</td>
</tr>
<tr>
<td>11</td>
<td>No Client-Consultant Service Agreements</td>
<td>DOW has no stick with which to hit the consultants. The DOW is limited with regards its actions towards deficient performance of consultants as they cannot put into practice some of their corrective ideas due to the absence of a Service Agreement.</td>
</tr>
<tr>
<td>12</td>
<td>The 3 year budget system is not working</td>
<td>Due to inflation and currency fluctuations the 3 year budgeting plan has fallen short on a number of occasions resulting in shortage of funds to complete projects</td>
</tr>
</tbody>
</table>

4.6 SUMMARY OF RESEARCH FINDINGS

The aim behind this research is the recommendation of a project control system that will aid the delivery of capital construction projects within the Namibian public sector. As such, objectives were formulated in order to achieve the research aim. Below are the main research findings structured against the research objectives:
4.6.1 Objective 1: Ascertain current project success rates on CPM/DOW capital projects

It was found that the highest overall success rate is 54% which caters for how successfully projects are completed within schedule and within budget. It was also found that project overall success increases with the increase in project size due to Tender Board regulations on appointment of contractors for different size projects.

4.6.2 Objective 2: Ascertain effectiveness of current control tools in use at the CPM division

The research findings show that the current control tools in use are only half effective with schedule control tools scoring 2.5 out of 5, cost control tools 2.4 out of 5, and quality control tools 2.7 out of 5. The effectiveness range is therefore from 48% to 54%. Improvements to the current control system are therefore required to enable the DOW to meet its 2012 – 2017 strategic plan.

4.6.3 Objective 3: Identify the major challenges in CPM capital construction projects implementation, and perform a root-cause analysis for the challenges identified

This objective will be looked at variable by variable, starting with challenges in controlling the time variable.

4.6.3.1 Challenges in Controlling the Time Variable

Time variable is dependent on the independent variables of management planning and management organising. From the research results the three biggest sources of project delays arise from the contractor (contributing 25% to project delays), the consultant (contributing 23% to project delays) and the user-ministry (contributing 19% to project delays). In all the organisations it was established that the management elements (planning and organising) are missing or operate on a small scale, hence the delays experienced during project implementation. The main reasons for absence of management elements are given in Table 4.6.1 overleaf.
### Table 4.6.1: Reasons for absence of management elements

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contractor</td>
<td>Lack of management skill and lack of experience</td>
</tr>
<tr>
<td>Consultant</td>
<td>Mis-understanding of the role of the PA with the CPM/DOW</td>
</tr>
<tr>
<td>User-Ministry</td>
<td>Low Project Management Maturity</td>
</tr>
</tbody>
</table>

#### 4.6.3.2 Challenges in Controlling the Cost Variable

The cost variable is dependent on the intermediary variables of resource requirements, scope of works, and project time, and project risk which are ultimately dependent on the independent variables of client’s requirements, management planning and organising. From the data collection results the main contributor to budget over-runs as follows:

- **user ministry** by means of additional requirements which in turn increase the scope of works and ultimately affect the budget **33% budget over-run**. This is an indication of poor management planning on the user ministry
- **consultants** mistakes in design and documentation as the second biggest cause of budget **over-runs 21%** (13% mistakes + 9% unrealistic budget)
- Escalations due to market conditions 6%
- The Capital Project Management/Department of Works tender process and tender adjudication process contributes 5%. This is as mainly a result of poor human resource practices (See Appendix 4.1 Item 2)

Contractors’ lack of experience and deficiencies with the current contract in use contribute minimally to budget overruns (3% each).

#### 4.6.3.3 Challenges controlling the Quality Variable

The biggest contributor to poor quality of projects is poor workmanship by contractors which points to lack of quality plan and/or poor implementation of the quality plan by consultants. This contributes 40% to poor quality respectively. The delay in project implementation, which gives plenty of time for user-Ministry needs to change before project completion, contributed 20% to client dissatisfaction and was also noted as a significant challenge to quality control.
### 4.6.3.4 Summary of challenges

The challenges can be summarized in Table 4.6.2 below.

**Table 4.6.2: Summary of Challenges**

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>User Ministry</th>
<th>CPM/DOW</th>
<th>Consultants</th>
<th>Contractor</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initiation</strong></td>
<td>Poor planning i.e. Poor needs assessment, Unclear scope parameters, Poor project justification</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Planning &amp; Designs</strong></td>
<td>Poor budgeting parameters (3 yr budgeting system not working well)</td>
<td>1. Inadequate Project management practices 2. Unclear briefs to consultants 3. Unclear operation parameters for consultants 4. Lengthy approval processes 5. Poor HR practices</td>
<td>1. Poor coordination amongst consultants 2. Documentation errors including Inaccurate/Unrealistic budget estimate &amp; Unrealistic schedule for quantum of work</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| **Implementation (Construction)** | Scope creep  
Late payment/Non payment to contractor | Lengthy approvals of VOs  
Slow processes  
Documents lost  
Restrictive operating parameters  
Tender Board Regulations | Lack of planning/organising skills  
Lack of experience  
Lack of technical skill | Escalations  
Inclement weather  
Poor site location (far away from supporting facilities) | |
| **Monitoring and Evaluating** | Project coordinator has little decision making power  
Restrictive operation parameters set by public sector | No/limited supervision for quality, scope mgt | Poor workmanship | | |
The findings above somewhat contradict Achterstraat’s (2013) findings of poor governance, lack of effective leadership and inadequate project management. The major reasons for project failure in Namibia’s public sector are, rather, the lack of astute planning and organising by user-ministries, inexperienced contractors and/or inadequate quality implementation by consultants.

4.6.4 Objective 4: Ascertain factors critical for project success

Whilst Figures 4.5.10, 4.5.18 and 4.5.21 identify approximately 40 factors as aiding success of capital projects, some were recurring and were found to have the highest impact on project success. The three most significant success factors are namely contractor competence and experience, competent and proactive consultants team, use of planning and organising skills by contractor, consultants, user ministry and CPM/DOW, supervision by consultants, user-ministry involvement from early stage of the project to project closure, limited scope creep, and accurate documentation from consultants.

4.7 CHAPTER CONCLUSION

Having identified the challenges or causes of deviancy in project implementation, recommendations for the elimination of such challenges and deviances can now be made. The researcher used the scientific experimentation model of the control theory seeks to formulate such recommendations. This is carried out in the next chapter of this dissertation.
CHAPTER 5: CONCLUSIONS & RECOMMENDATIONS

5.1 RESEARCH CONCLUSIONS

5.1.1 Conclusion 1: Status of project delivery success at CPM division

As shown by the research findings that project delivery success is 54% this means that the current control system is functional but the project delivery success is still behind the 2012 – 2017 Strategic Plan. Therefore the current project management and project control system is inadequate and will need to be improved.

The results also show that CPM is better at delivering larger projects than smaller ones due to the higher contractors’ expertise in contractors suitable for larger projects. Again this is a result of tender board regulation which the DOW has no control over. As such there is little to nothing that can be done by DOW to resolve this.

5.1.2 Conclusion 2: Effectiveness of Current CPM/DOW Control Tools

The research findings show that the current control tools in use are only half effective with effectiveness ranging from 48% to 54%. A new control system needs to be recommended to increase effectiveness of project deliver.

5.1.3 Conclusion 3: Project challenges

Research found that project delays largely resulted from lack of planning and organising skill was within the user-ministries and contractors organisations. Cost overruns mainly resulted from user-ministries’ poor planning leading to additional works. Poor quality largely was a result of poor workmanship during construction resulting from inexperienced contractors and/or poor quality implementation by consultants. Therefore the three parties responsible for poor project delivery are the user-ministries, the contractor, and the consultants.
5.1.4 Conclusion 4: Project success factors

Success factors discovered to have the highest impact on project success at CPM are contractor experience, user-Ministry front-end loading/planning, and thorough consultant supervision. These are in-line with Kennedy’s (2012) findings. Again the DOW’s influence and control in these spheres is limited; selection of the contractor is limited by the Tender Board regulations, front-end loading is limited by exclusion from the initial project planning by user-Ministry, and there is limited control over consultants’ supervision.

5.2 HYPOTHESIS TESTING

From the research findings it was discovered that the major deviances arose from the user-ministries, the contractors, and the consultants. As such any recommended improvements to the CPM/DOW control system will be peripheral to effective delivery of public capital construction projects in Namibia. However, the deviances arising from consultants can be controlled by the DOW developing of a service agreement between the DOW and its consultants which clearly spells out the deliverables expected from the consultants, and allows for recourse in the event that such deliverables are not met. The hypothesis was therefore largely proven incorrect with the exception of the DOW/Consultant service agreement.

5.3 GENERAL RECOMMENDATIONS:

As the current project management system limits the DOW’s involvement in the most critical areas for project success, the best recommendations would be for the DOW to approach the relevant authorities and propose the following:

- DOW should be involved in the early stages of the project initiation phase to allow for better planning. As comprehensive planning at the beginning of the project cycle greatly increases changes of project success (Kennedy, 2012)
- The government as a whole should initiate and support capacity building in the area of technical and managerial skills development for its small and medium sized contractors
In the meantime the DOW/CPM can improve its own internal systems and decrease project delays by 12%, project cost overruns by 7%, and poor quality by 11%. The recommendations are as follows:

1. Development of a consultant service agreement which clearly states the deliverables expected and provides in the event that such deliverables are not met.

2. CPM/DOW should use a coordinated approach to project management to integrate all project activities. Such an approach will affect all of CPM/DOW project management practices including, Cost, Schedule, and Quality Management, Human Resource management, Procurement management, Communication management, risk management and project integration management to ensure all aspects of the projects move smoothly in a coherent manner. Currently such an approach is limited in its practice which is negatively affecting CPM/DOW’s internal processes thereby causing delays in project implementation, through poor HR practices, lack of clear operation parameters for the CPM/DOW project personnel, lack of clear project briefs and operating parameters for consultants, poor procurement strategy for procurement of services, and lengthy internal processes.

3. To remove the mis-understanding around the PA role, the CPM/DOW should appoint a project manager instead of a PA. This Project Manager can be from CPM/DOW or from the private sector. As such all project integration activities will fall under the mandate of project manager thereby ensuring that “management-as-organising” is taken care of

4. The CPM/DOW formulate a procurement strategy for the appointment of consultants as lack of such strategy is heavily impacting project completion on time. However, this is an area for further study and consultation.

5. To address the issue of contractor competence and lack of skill, CPM/DOW can undertake a skills transfer exercise as shown in Table 5.1 overleaf.
Table 5.1: Recommendations for dealing with local poor skill

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appointment of separate/independent management team</td>
<td>CPM/DOW can appoint a separate specially selected team of consultants (or DOW personnel) to execute some of the managerial duties for ill-equipped contractors especially SMEs. In the process skills transfer occurs.</td>
</tr>
<tr>
<td>Training seminars for contractors</td>
<td>The CPM/DOW through the CIF Hold training seminars for SME contractors on managerial skills and encourage SMEs to register with CIF</td>
</tr>
</tbody>
</table>

5.4 PHASE SPECIFIC RECOMMENDATIONS:

Having done the broad recommendations, recommendations specific pertaining control tools to be used at each project stage is shown in Table 5.2 below. These tools have been formulated based on the scientific experimentation model of control theory which seeks to address such the causes of deviancy in project plan by elimination of such causes.

Table 5.2: Recommended Control Tool System

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>User Ministry</th>
<th>CPM/DOW</th>
<th>Consultants</th>
<th>Contractor</th>
<th>Other</th>
</tr>
</thead>
</table>
| Initiation    | 1. Develop Project Charter which caters for needs assessment, project justification, and project parameters  
2. Involve CPM/DOW to assist with development of project charter | | | | | |
<table>
<thead>
<tr>
<th>Planning</th>
<th>Adoption of Best practices of project management approach to regularise and bring order the CPM/DOW’s operations. Develop comprehensive plan of project implementation with user-ministry so as to have clear briefs and operating parameters for consultants operations. Use KPI* to monitor internal processes and tracking systems as motivation for process improvement.</th>
<th>Transfer role of coordinating consultants to CPM/DOW project managers. All consultant documents to be checked &amp; approved by the CPM/DOW technical personnel before use.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implementaion/Constuction</td>
<td>CPM/DOW should ensure user-ministry signs freezing documents to “freeze” the scope of work and prevent future changes to scope. Give Project coordinator the role of Project Manager in project team. Use WBS¹ to allocate 1 person to no more than 2 tasks.</td>
<td>CPM/DOW project manager to enforce supervision through regular supervision reports. CPM/DOW appoint separate management team to do the planning and organising on behalf of the contractor.</td>
</tr>
<tr>
<td>Monitoring &amp; Review</td>
<td>1. Use KPI* to monitor internal processes 2. Introduce a separate audit team to improve internal processes.</td>
<td>Regular monitoring using a well documented quality plan.</td>
</tr>
<tr>
<td>Closure</td>
<td>Enforce signed freezing documents to prevent additional scope. 1. Use KPI* to monitor internal processes 2. Introduce a separate audit team to challenge &amp; improve internal processes.</td>
<td></td>
</tr>
</tbody>
</table>

¹- Work Breakdown Structure  
²- Key Performance Indicators
5.5 LIMITATIONS OF THE CONTROL TOOLS SYSTEM RECOMMENDED:

Koskela and Howell (2002) admit that the competing theory to project management is still in its beginning phases and needs improvement through further research. Some of the limitations identified by the researcher to the competing theory of project management are listed below.

- The theory assumes that the plan against which deviancy is measured is perfect and has no deficiencies. For example, if cost control is measured against an erroneous budget the control tool employed to resolve the budget over-run will not be effective.
- There are some causes of deviancy that “cannot” be changed or cannot be changed immediately. Examples of such factors are macro-economic and political issues such as national economic woes that may be affecting project implementation. However, research findings show that these issues only contribute minimally to project failure, and as such eliminating them will not significantly improve project success at CPM/DOW.
- The model is also limited in its control of at project initiation because this activity falls in the domain of the user-ministry and CPM/DOW can only be involved if the user-ministry allows. Nonetheless, some ‘post-event’ control can be done by means of analysing the user-ministries’ project charters, or by developing CPM/DOW project charters after consulting the user-ministries pertaining their needs.

With regards the Namibian public operating environment, the following limitations were noted by the researcher pertaining the effectiveness of the control tools generated by competing theory of project management in Table 5.2:

- Change in the Tender Board regulations as shown in Appendix 2.2 is likely to happen only in the event of new political leadership or massive opposition from people groups. This is left to the political realm to address.
- The model is also limited in its address of macro-economic issues such as national education and skill levels in the country and in the construction industry. To solve this challenge deeper involvement of other government and non-governmental institutions will be required including the Office of the Prime
Minister, Ministry of Education, CIF, and other non-governmental construction industry bodies to find a long-term cure.

Nonetheless the scientific experimentation model is largely adequate in that it seeks to address problems specific to a project, and eliminate such problems.

5.6 AREAS OF FURTHER STUDY

As advocated by Koskela and Howell (2002) further studies are needed with regards the competing theory of project management. The researcher suggests that research be conducted with the aim of identifying the best project management approach to be taken by the CPM/DOW division having analysed the organisation using analytical tools such as McKinsey’s 7S framework. Research also needs to be done to determine the level of Project Management Maturity within the CPM/DOW division as this will have impact on selection of project management approach and can modify the control system recommended in this research.

As mentioned in Chapter 3, one of the limitations of this research is that it uses one case study of one public department in one ministry of Namibia making generalisation of results difficult. The researcher advises that each Ministry in Namibia conduct similar studies so as to formulate control systems effective in their respective domains.
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3. Achterstraat P., September 2013, Why large public sector projects sometimes fail, Auditor-General of New South Wales, The Audit Office New South Wales Australia
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APPENDICES
### Appendix 2.1 – Amendment No. 1 to Tender Board Circular 1 of 2013

<table>
<thead>
<tr>
<th>Item</th>
<th>Estimated project cost</th>
<th>Preferences</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>below N$20 Million</td>
<td>These projects are for entities with SME status which is confirmed by a certificate from the Ministry of Trade and Industry in that regard.</td>
</tr>
<tr>
<td>2</td>
<td>N$20 Million up to N$60 Million</td>
<td>These projects are for entities with 100% Namibian ownership of which no less than 30% should be owned by previously disadvantaged Namibian persons</td>
</tr>
<tr>
<td>3</td>
<td>Above N$ 60 million</td>
<td>All entities are eligible but preference is given to entities with no less than 51% Namibia ownership of which no less than 30% is owned by previously disadvantaged Namibian persons</td>
</tr>
</tbody>
</table>

Source: Tender Board of Namibia, Ministry of Finance, Namibia
## Appendix 2.2: CIF Classification of Contractors based on annual turnover

<table>
<thead>
<tr>
<th>Contracting Member</th>
<th>Categories as determined by Annual Turnover</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>&gt;N$200 million</td>
</tr>
<tr>
<td>B</td>
<td>&gt;N$100 - &lt;N$200 million</td>
</tr>
<tr>
<td>C</td>
<td>&gt;N$50 - &lt;N$100 million</td>
</tr>
<tr>
<td>D</td>
<td>&gt;N$20 - &lt;N$50 million</td>
</tr>
<tr>
<td>E</td>
<td>&gt;N$10 – &lt;N$20 million</td>
</tr>
<tr>
<td>F</td>
<td>&gt;N$5 - &lt;N$10 million</td>
</tr>
<tr>
<td>G</td>
<td>&gt;N$2 – N$5 million</td>
</tr>
<tr>
<td>H</td>
<td>&lt;N$2 million</td>
</tr>
</tbody>
</table>

Though SME status is determined by the Ministry of Trade and Industry and not by CIF annual turnover classification, a lot of the SMEs registered with CIF fall within category H of annual turnover.
<table>
<thead>
<tr>
<th>Subject of Theory</th>
<th>Relevant Theories</th>
<th>Conceptualisation</th>
<th>Principles</th>
<th>Assumptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project</td>
<td>Transformation</td>
<td>Project is a transformation of inputs to outputs</td>
<td>1 The total transformation of a project can be decomposed into manageable and well-understood sub-transformations, tasks 2 A project can be realized in an optimal manner by realizing each task in an optimal manner and the tasks in optimal sequence Corollary: Project performance can be performed by improving the tasks</td>
<td>1 Tasks are independent, except sequential relationships 2 Tasks are discrete and bounded 3 Uncertainty as to requirements and tasks is low 4 All work is captured by top-down decomposition of the total transformation 5 Requirements exist at the outset and they can be decomposed along with work</td>
</tr>
<tr>
<td>Management</td>
<td>Planning</td>
<td>There is a managerial part and an effector part in the project; the primary function of the managerial part is planning and the primary function of the effector part is to translate the resultant plan into action.</td>
<td>1 Knowing the current state of the world, the desired goal state, and the allowable transformations of state that can be achieved by actions, a series of actions, the plan, can be deduced. 2 The plan is translated into reality by the effector part of the organization.</td>
<td>1 Translating a plan into action is a simple process, by following directions. 2 The internal planning of a task is a matter of the person to whom the task has been assigned</td>
</tr>
<tr>
<td></td>
<td>Classical</td>
<td>Managerially, execution is about dispatching tasks to work stations.</td>
<td>When, according to the plan, the time has arrived to begin task execution, it is authorized to start, in speech or in writing.</td>
<td>1 The inputs to the task and the resources to execute it are ready at the time authorization. 2 The task is fully understood, started and completed according to the plan once authorized.</td>
</tr>
<tr>
<td></td>
<td>Communication</td>
<td>Managerially, execution is about dispatching tasks to work stations.</td>
<td>The possible variance between the standard and the measured value is used for correcting the process so that the standard can be reached</td>
<td>1 The process is of continuous flow type, the performance of which is measured at aggregate terms 2 The process can easily be corrected by the control available.</td>
</tr>
<tr>
<td></td>
<td>Thermostat model</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix 2.4: Detailed Description of Control Tools:

<table>
<thead>
<tr>
<th>Item</th>
<th>Project Stage</th>
<th>Control Tool</th>
<th>Description</th>
</tr>
</thead>
</table>
| A    | Project Initiation and Planning Controls | Comprehensive Formal Planning & the Adoption of Project Management Methodologies | 1. Use a formal planning approach for complex projects is in itself a control tool. As projects get larger they can reach a level of complexity where ad hoc approaches to project management become wasteful and inefficient; pragmatic, systematic and comprehensive approaches to planning and managing projects are needed at this juncture (MindTools 2014).  
2. Planning includes:  
   - integration planning to make sure all components of the project move collectively together,  
   - resources planning to ensure adequate resources (human, financial, equipment, etc) during lifespan of the project,  
   - schedule planning to prevent major changes in the project schedule,  
   - cost planning to prevent budget over-runs,  
   - scope and quality planning to ensure adherence of works to a pre-determined set of standards,  
   - communication planning to ensure accurate and speedy flow of information between parties, |
3. Adoption/Adaption & Consistent Use of Best Project Management Practices: for large projects project management becomes a technical discipline in its own right (MindTools, 2014). Examples of best practices of project management such as provided by the Project Management Institute (PMI) through its PMBOK, the Office of Government Commerce’s PRINCE2, PRiSM, or any other appropriate project management methodology. An effective project methodology however, has to suit the peculiar nature of the project at hand, and may sometimes need to be altered in line with the project demands.

<table>
<thead>
<tr>
<th>B</th>
<th>Planning Controls</th>
<th>The Contract Duration &amp; Contract Programme</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>During the planning period an estimate of the amount of time necessary for the execution of a project is done. This duration is then used as a benchmark to keep the project on-track. In some cases the duration is included in contract documents which upon contract acceptance become a contractual. This forces the contracting parties to adhere to the contractual duration by preparing their work programmes in line with the contractual duration.</td>
<td></td>
</tr>
</tbody>
</table>
Lack of scope control (or scope creep) has been termed one of the significant culprits of project schedule and budget over-runs. It occurs whereby the scope of the works keeps increasing by the addition of new features product designs that have already been approved, without providing equivalent increases in budget, time and/or other project resources (Villanovau University, 2013). According to ProjectSmart, as quoted by Villanovau University (2013), scope creep can be as a result of various effects such as the following:

- poor requirements analysis,
- not involving the users early enough resulting in additional client requirements during implementation, (in DOW case involvement of user at implementation = scope creep)
- poorly defined project parameters,
- mis-understood and/or uncertain client requirements,
- underestimating the complexity of the project,
- unforeseen site conditions,
- lack of change control,
- poor communication processes,
- weak project management team, and
- gold plating which is justifying scope increase in the belief that value is being added.

Measures to control scope creep during the project planning stage include the following:
(Project Smart, 2013):
1. Thoroughly understanding the project vision
2. Understand the end-user’s/stakeholders’ priorities and those of the project team, and then sync the two sets of priorities.
3. Define the project deliverables and have them approved by the project stakeholders
4. Break the approved deliverables into detailed and actual work requirements.
5. Break the project down into major and minor milestones and complete a generous project schedule to be approved by the project stakeholders.
6. Determine the critical activities in the project using Critical Path Method (CPM) or a Project Evaluation and Review Technique (PERT) chart or work breakdown structure (WBS) and evaluate it regularly as the project progresses. This gives a map which determines which deliverables must be completed on time.

Expect that there will be scope creep. Implement change order forms early and educate the project stakeholders on the processes. A change order form will allow the project manager to perform a cost-benefit analysis before scheduling changes requested by the project stakeholders.
<table>
<thead>
<tr>
<th>D</th>
<th>Procurement Management</th>
<th>Rising asset-construction costs are increasing the pressure for operational excellence (Accenture, 2012). The need for a predetermined procurement method is thus more serious. According to Accenture (2012) improved contracting strategies have become more relevant. In controlling procurements control tools include performance appraisals, and vetting service providers for capacity to meet client’s requirements.</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>Implementation Controls</td>
<td>Implementation controls emanate form the project planning phase. The main tools used are the project schedule, the project budget, and the quality plan. The <strong>Programme of Works/Project Schedule</strong> is largely used as a benchmark for performance. As the project progresses, regular comparison between the project schedule and actual site progress is necessary to effect good time management. Likewise the <strong>Project Budget</strong> is used as a benchmark and a monitoring tool for project expenditure. The Quality plan is used to ensure conformance to certain set standards detailed during the planning stage of the project.</td>
</tr>
<tr>
<td>F</td>
<td>Project Closure Controls</td>
<td>1. Final inspection of the product, 2. testing and commissioning of the product, 3. document control, Project closure tools ensure that the stakeholders are satisfied and all acceptance criteria have been met by gathering project records and disseminating information to formalise acceptance of the product, service or project (Watt, 2013).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>training</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>schedule for preparation of the final documents such as the Final Accounts, Certificates of Completion, Quality Certificates, etc</td>
<td></td>
</tr>
</tbody>
</table>
Appendix 3

Questionnaires
Questionnaire: Project Coordinators

Effective project management controls for capital projects for the Department of Works, Namibia

IN PARTIAL FULFILMENT OF THE MASTERS OF BUSINESS ADMINISTRATION POSTGRADUATE DEGREE

AT THE

GRADUATE SCHOOL OF MANAGEMENT

UNIVERITY OF ZIMBABWE

FACULTY OF COMMERCE

(JULY 2011 INTAKE)

Dear Sir/Madam

You have been selected as a respondent for the above mentioned research. The research aims to determine the most appropriate project management controls for the effective and efficient delivery of capital projects in the public sector. The information required is for academic purposes only. Your identity will not be disclosed to any party other than to the researcher. Your co-operation will be much appreciated.
1. Please name any 4 projects that you are currently co-ordinating
   ........................................................................................................................................................................
   ........................................................................................................................................................................
   ........................................................................................................................................................................
   ........................................................................................................................................................................

2. Indication of size of project in monetary terms:
   2.1 How many of projects stated above have a value below N$20 Million ......................
   2.2 Between N$20 Million and N$ 60 million ..............................................
   2.3 Above N$60 million ..............................................

3. Please state the Principal agent for each project:
   Project 1:
   ........................................................................................................................................................................
   Project 2:
   ........................................................................................................................................................................
   Project 3:
   ........................................................................................................................................................................
   Project 4:
   ........................................................................................................................................................................

   How do you rate the effectiveness, strength and pro-activeness of the Principal Agent?
   Project 1:  
   □ Very good  □ Good  □ Average  □ Poor
   Project 2:  
   □ Very good  □ Good  □ Average  □ Poor
   Project 3:  
   □ Very good  □ Good  □ Average  □ Poor
   Project 4:  
   □ Very good  □ Good  □ Average  □ Poor

A: SCHEDULE CONTROL

4. How many of the projects stated in Question 1 above are progressing on time or within the original schedule?
4.1 Projects below N$20 million
☐ None  ☐ One project  ☐ Two projects  ☐ Three projects  ☐ All of them

4.2 Projects between N$20 Million and N$60 million
☐ None  ☐ One project  ☐ Two projects  ☐ Three projects  ☐ All of them

4.3 Projects above N$60 million
☐ None  ☐ One project  ☐ Two projects  ☐ Three projects  ☐ All of them

If at least one project is lagging behind the original programme please answer question 5 below. If all of them are progressing within the original schedule please proceed to question 6.

5. What would you say are the contributing factors to the projects’ delay(s)?

Factor 1:
..................................................................................................................................................................

Factor 2:
..................................................................................................................................................................

Factor 3:
..................................................................................................................................................................

Factor 4:
..................................................................................................................................................................

Factor 5:
..................................................................................................................................................................

6. Are there any measures that are being employed by the Department of Works, or zone, to ensure that projects are delivered on time?

YES ☐ NO ☐ UNSURE ☐

6.1 If your answer above is “YES” Please state the measures employed

(i) ..................................................................................................................................................................

(ii) ..................................................................................................................................................................

(iii) ..................................................................................................................................................................

(iv) ..................................................................................................................................................................
B: COST CONTROL

7. How many of the projects you are co-ordinating are progressing within the original budget

7.1 Projects below N$20 million

☐ None  ☐ One project  ☐ Two projects  ☐ Three projects

☐ All of them

7.2 Projects between N$20 Million and N$60 million

☐ None  ☐ One project  ☐ Two projects  ☐ Three projects

☐ All of them

7.3 Projects above N$60 million

☐ None  ☐ One project  ☐ Two projects  ☐ Three projects

☐ All of them

If at least one project is over budget please answer question 8 below. If all the projects are still within the original budget please proceed to question 9.

8. What would you say are the contributing factors to the projects over expenditure
   (i) ........................................................................................................................................................................
   (ii) .......................................................................................................................................................................
   (iii) ....................................................................................................................................................................
   (iv) .......................................................................................................................................................................

C: QUALITY CONTROL

9. Have you co-ordinated any projects that have reached Practical Completion or Final Completion?
   YES  ☐  NO  ☐

   If your answer for question 9 above is “YES”, please answer question 10 overleaf.
10. How many of the projects handed-over satisfied the clients’ requirements?
   0  1 -  3  3 - 6  over 6  All

   If in at least one project the client was unhappy about the quality (facilities and functionalities) on the building please answer question 11 below:

11. May you state the reasons given by the client for his/her dissatisfaction
   (i) .............................................................................................................................................
   (ii) .............................................................................................................................................
   (iii) .............................................................................................................................................
   (iv) .............................................................................................................................................
   (v)  .............................................................................................................................................

C) CONTROL TOOLS:

12. What tools have been used on your projects to control the following aspects of a project:
   12.1 Project Schedule/ Time

   CONTROL TOOL 1:
   .............................................................................................................................................

   CONTROL TOOL 2:
   .............................................................................................................................................

   CONTROL TOOL 3:
   .............................................................................................................................................

   CONTROL TOOL 4:
   .............................................................................................................................................

   CONTROL TOOL 5:
   .............................................................................................................................................

b) How effective (on a scale of 1 – 5) have these tools been in keeping the project on-time, where score 1 is very effective and 5 is ineffective?

<table>
<thead>
<tr>
<th>Tool</th>
<th>Success Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Tool 1</td>
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<td>Control Tool 4</td>
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<tr>
<td>Control Tool 5</td>
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</tbody>
</table>
12.2 Project Cost

a) CONTROL TOOL 1:

..............................................................................................................................................................................

CONTROL TOOL 2:

..............................................................................................................................................................................

CONTROL TOOL 3:

..............................................................................................................................................................................

CONTROL TOOL 4:

..............................................................................................................................................................................

CONTROL TOOL 5:

..............................................................................................................................................................................

b) How effective (on a scale of 1 – 5) have these tools been in keeping the project within budget (where 1 = very effective and 5 = ineffective)?

<table>
<thead>
<tr>
<th>Tool</th>
<th>Success Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Tool 1</td>
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<tr>
<td>Control Tool 2</td>
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<tr>
<td>Control Tool 3</td>
<td></td>
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<tr>
<td>Control Tool 4</td>
<td></td>
</tr>
<tr>
<td>Control Tool 5</td>
<td></td>
</tr>
</tbody>
</table>

12.3 a) Project Scope/Quality – Please state measures/control tools put in place by the DoW/zone to make sure projects meet the client’s facilities and functionality requirements.

CONTROL TOOL 1:

..............................................................................................................................................................................

CONTROL TOOL 2:

..............................................................................................................................................................................
CONTROL TOOL 3:

CONTROL TOOL 4:

CONTROL TOOL 5:

b) How effective (on a scale of 1 – 5) have these tools been in keeping ensuring that the client requirements are met, where score 1 = very effective and 5 = ineffective?

<table>
<thead>
<tr>
<th>Tool</th>
<th>Success Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Tool 1</td>
<td></td>
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<tr>
<td>Control Tool 2</td>
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<tr>
<td>Control Tool 3</td>
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<tr>
<td>Control Tool 4</td>
<td></td>
</tr>
<tr>
<td>Control Tool 5</td>
<td></td>
</tr>
</tbody>
</table>

D) PROJECT SUCCESS FACTORS:

11. a) For the projects that are being implemented within the original schedule may you indicate what you consider to be the success factors behind these projects

   (i) .............................................................................................................................................................

   (ii) .............................................................................................................................................................

   (iii) .............................................................................................................................................................

   (iv) .............................................................................................................................................................

   (v) .............................................................................................................................................................

b) For the projects that are being implemented within the original budget may you indicate the what you consider to be the success factors behind these projects

   (i) .............................................................................................................................................................

   (ii) .............................................................................................................................................................
c) For the projects that are have met the client’s requirements may you indicate the what you consider to be the success factors behind these projects

(i) ...........................................................................................................................................................................

(ii) ...........................................................................................................................................................................

(iii) ...........................................................................................................................................................................

(iv) ...........................................................................................................................................................................

(v) ...........................................................................................................................................................................

End of questionnaire

Thank you for your participation
Dear Sir/Madam

You have been selected as a respondent for the above mentioned research. The research aims to determine the most appropriate project management controls for the effective and efficient delivery of capital projects in the public sector. The information required is for academic purposes only. Your identity will not be disclosed to any party other than to the researcher. Your co-operation will be much appreciated.

NB: You are not obliged to participate in this research and there will be no negative repercussions in the event that you chose not to participate, or to discontinue your participation.

Thank-you
1. How many government projects are you currently handling


2. Indication of size of project in monetary terms:

2.1 How many of your current government projects have a value below N$20 Million


2.2 Between N$20 Million - N$60million


2.3 Above N$60million


A: SCHEDULE CONTROL

3. How many of the projects stated in Question 1 above are progressing on time or within the original schedule?

3.1 Projects below N$20 million

☐ None  ☐ 1 - 10  ☐ 11 - 20  ☐ 21 - 30  ☐ All of them

3.2 Projects between N$20 Million and N$60million

☐ None  ☐ 1 - 10  ☐ 11 - 20  ☐ 21 - 30  ☐ All of them

3.3 Projects above N$60million

☐ None  ☐ 1 - 10  ☐ 11 - 20  ☐ 21 - 30  ☐ All of them

If at least one project is lagging behind the original programme please answer question 4 below. If all of them are progressing within the original schedule please proceed to question 5.

4. What would you say are the contributing factors to the projects’ delay(s)?

Factor 1:

........................................................................................................................................................................................................................................
Factor 2:  

Factor 3:  

Factor 4:  

Factor 5:  

B: COST CONTROL  

5. How many of the projects you are co-ordinating are progressing within the original budget  
5.1 Projects below N$20 million  
   None    □ 1 - 10    □ 11 - 20    □ 21 - 30    □ All of them  
5.2 Projects between N$20 Million and N$ 60million  
   None    □ 1 - 10    □ 11 - 20    □ 21 - 30    □ All of them  
5.3 Projects above N$60million  
   None    □ 1 - 10    □ 11 - 20    □ 21 - 30    □ All of them  

If at least one project is over budget please answer question 6 below. If all the projects are still within the original budget please proceed to question 7.  

6. What would you say are the contributing factors to the projects over expenditure  
   (v)                                                                                                                  
   (vi)                                                                                                                 
   (vii)                                                                                                                 

(viii)  

(vi)  

(vii)
C: QUALITY CONTROL

7. Have you co-ordinated any projects that have reached Practical Completion or Final Completion?
   YES [ ] NO [ ]

   If your answer for question 7 above is “YES”, please answer question 8 below.

8. How many of the projects handed-over satisfied the clients’ requirements in terms of facilities available and functionality of the structures?
   0 [ ] 1 - 5 [ ] 6 - 10 [ ] 10 - 15 [ ] Over 15 [ ]

   If in at least one project the client was unhappy about the quality (facilities and functionalities) on the building please answer question 9 below:

9. May you state the reasons given by the client for his/her dissatisfaction
   (vi) ...............................................................................................................................................
   (vii) ...............................................................................................................................................
   (viii) ..............................................................................................................................................
   (ix) ................................................................................................................................................
   (x) ................................................................................................................................................
C) CONTROL TOOLS:

10. What tools have been used on your projects to control the following aspects of a project:

12.4 Project Schedule/ Time

CONTROL TOOL 1:

CONTROL TOOL 2:

CONTROL TOOL 3:

CONTROL TOOL 4:

CONTROL TOOL 5:

b) How effective (on a scale of 1 – 5) have these tools been in keeping the project on-time, where score 1 is very effective and 5 is ineffective?

<table>
<thead>
<tr>
<th>Tool</th>
<th>Success Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Tool 1</td>
<td></td>
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<tr>
<td>Control Tool 2</td>
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<td>Control Tool 3</td>
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<tr>
<td>Control Tool 4</td>
<td></td>
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<tr>
<td>Control Tool 5</td>
<td></td>
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</tbody>
</table>

12.5 Project Cost

c) CONTROL TOOL 1:

..................................................................................................................
CONTROL TOOL 2:

..................................................................................................................................................................................

CONTROL TOOL 3:

..................................................................................................................................................................................

CONTROL TOOL 4:

..................................................................................................................................................................................

CONTROL TOOL 5:

..................................................................................................................................................................................

d) How effective (on a scale of 1 – 5) have these tools been in keeping the project within budget (where 1 = very effective and 5 = ineffective)?

<table>
<thead>
<tr>
<th>Tool</th>
<th>Success Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Tool 1</td>
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<td>Control Tool 3</td>
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<tr>
<td>Control Tool 4</td>
<td></td>
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<tr>
<td>Control Tool 5</td>
<td></td>
</tr>
</tbody>
</table>

12.6 a) Project Quality

CONTROL TOOL 1:

..................................................................................................................................................................................

CONTROL TOOL 2:

..................................................................................................................................................................................

CONTROL TOOL 3:

..................................................................................................................................................................................
CONTROL TOOL 4:

...........................................................................................................................................................................

CONTROL TOOL 5:

...........................................................................................................................................................................

b) How effective (on a scale of 1 – 5) have these tools been in keeping ensuring that the client requirements are met, where score 1 = very effective and 5 = ineffective?

<table>
<thead>
<tr>
<th>Tool</th>
<th>Success Scale</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Control Tool 3</td>
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<tr>
<td>Control Tool 4</td>
<td></td>
</tr>
<tr>
<td>Control Tool 5</td>
<td></td>
</tr>
</tbody>
</table>

D) PROJECT SUCCESS FACTORS:

12. a) For the projects that are being implemented within the original schedule may you indicate what you consider to have been the success factors behind these projects

(vi) ........................................................................................................................................................................

(vii) ........................................................................................................................................................................

(viii) .......................................................................................................................................................................

(ix) ........................................................................................................................................................................

(x) ........................................................................................................................................................................
b) For the projects that are being implemented within the original budget may you indicate the what you consider to have been the success factors behind these projects

(vi) ........................................................................................................................................

(vii) ........................................................................................................................................

(viii) ........................................................................................................................................

(ix) ........................................................................................................................................

(x) ........................................................................................................................................

c) For the projects that are have met the client’s requirements may you indicate the what you consider to have been the success factors behind these projects

(vi) ........................................................................................................................................

(vii) ........................................................................................................................................

(viii) ........................................................................................................................................

(ix) ........................................................................................................................................

(x) ........................................................................................................................................

End of questionnaire

Thank you for your participation
Appendix 4.1: Detailed explanation of project success results

Findings from observation, Meetings and Site visits:

The table below details the results from data collected using the tools of observation during site visits and observation of internal processes, attendance in meetings, and from minutes of meetings.

<table>
<thead>
<tr>
<th>Item</th>
<th>Size of Project</th>
<th>Calibre of Contractor</th>
<th>Project Status</th>
<th>Exhibition of Managerial &amp; Technical skill</th>
<th>Interview Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Below N$20Mil</td>
<td>SME</td>
<td>Progress of Works: 22%, Time spent on project: 97% of the contract period. EOT(^1) already sought</td>
<td>Poor supply chain management: Fails to take into consideration lead times for supply of materials Poor financial management: Constantly seeks financial assistance from User-Min Limited appreciation of his responsibility/liability to the client - Refuses to take a bank loan to finance procurement of material, believes government must support him Failure to schedule structural work to allow for expedient consultant inspection – consultant spent 33hrs on site in 1 month vs the normal 8 hrs supervision Constantly requires Structural consultants input during construction Failure to read some drawings – causing delays Limited # of site labourers</td>
<td>Contractor has little to no appreciation of contract conditions User-Min rep confirms on some occasions there is no labour on site – the site is dead no progress Contractor brings labour to site only when consultants come to supervise works</td>
</tr>
<tr>
<td></td>
<td>N$20Mil – N$60Mil</td>
<td>100% Namibian Company</td>
<td>Progress of Works: Estimated 79%</td>
<td>Technical expertise available but poor managerial commitment to project hinders work (fails to procure resources necessary for project progress)</td>
<td>NB: There was poor supervision of work by PA, who then later resigned from the project</td>
</tr>
<tr>
<td>---</td>
<td>-------------------</td>
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<td>----------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Time spent on project: 120% project in Delay EOT 1 approved, EOT 2 underway (reasons not substantial)</td>
<td>No HR management – Site foreman overwhelmed acts as Site Foreman, Project Manager, Civil/Structural Engineer, QS,</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Quality of Project: Material specs substituted for less expensive equivalent Inadequate infrastructure i.e. data &amp; access control facilities had been omitted from design by consultant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>N$20 – N$60Mil</td>
<td>100% Namibian Contractor – Category A Contractor Well established</td>
<td>Progress of Work: 85% Time spent on project: (no schedule) Project Quality: Good</td>
<td>Extensive scope creep on project (83%) due to User-Min additional instructions Financial constraints due to lack of Cabinet approval to increase contract amount</td>
<td></td>
</tr>
</tbody>
</table>
### Appendix 4.2: Assessment of Schedule Control tool Effectiveness

<table>
<thead>
<tr>
<th>Control Tools currently in use</th>
<th>S</th>
<th>C</th>
<th>O</th>
<th>R</th>
<th>E</th>
<th>S</th>
<th>S</th>
<th>C</th>
<th>O</th>
<th>R</th>
<th>E</th>
<th>S</th>
<th>TOTAL</th>
<th>Average Score</th>
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<tr>
<td>Gnatt Chart</td>
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<td>1</td>
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<td>Regular Progress Monitoring through meetings</td>
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<td>Procurement of Appropriate PA &amp; Contractor</td>
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<td>Scope reduction</td>
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<tr>
<td>Quick Decision Making by DOW</td>
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</tr>
</tbody>
</table>

**Table 4.5.1: Effectiveness of Schedule Control Tools in use**

Average Score: 2.5
### Appendix 4.3: Assessment of Cost Control tool Effectiveness

#### COST CONTROL TOOLS

#### EFFECTIVENESS:

<table>
<thead>
<tr>
<th>Control Tools currently in use</th>
<th>S</th>
<th>C</th>
<th>O</th>
<th>R</th>
<th>E</th>
<th>S</th>
<th>C</th>
<th>O</th>
<th>R</th>
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<th>TOTAL</th>
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*Table 4.5.2: Effectiveness of Project Cost Control Tools in use at CPM/DOW*
### Appendix 4.4: Assessment of Quality Control tool Effectiveness

#### QUALITY CONTROL TOOLS

**EFFECTIVENESS:**

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*Table 4.5.3: Effectiveness of Control Tools in use at CPM/DOW*