



SELINUS UNIVERSITY

OF SCIENCES AND LITERATURE

THE IMPACT OF PROJECT MANAGEMENT IN ENGINEERING: A CASE STUDY OF THE ROADS AUTHORITY CIVIL ENGINEERS, WINDHOEK – NAMIBIA

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A DISSERTATION

Presented to the Department of Project Engineering Management

Faculty of Business & Media

In fulfilment of the requirements for the degree of Doctor of Philosophy (PhD)
in Project Engineering Management

2023

DECLARATION

“I do hereby attest that I am the sole author of this thesis and that its contents are only the result of the readings and research I have done”

Student Signature:

A handwritten signature in black ink, appearing to read 'Sibongo Eustace Nfwambi', with a stylized flourish at the end.

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ACKNOWLEDGEMENT

The completion of this thesis is a result of great support and sacrifice given by the personnel of Roads Authority organisations that participated in the research. I would like to express my gratitude to the support given by the organisation. My heartfelt gratitude goes to the academic and support staff at Selinus University of Science and Literature for guidance.

DEDICATION

This dissertation is dedicated to my life partner Herta N Lukileni, who has been patient with me, provided foundation, encouragement and support throughout this entire experience. I am blessed to have you as my partner.

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ABSTRACT

Project management practices have been proposed as instruments for improving the quality and performance of organisations and have often been advocated as universally applicable to all organisations and activities. However, the implementation of these practices has been characterised by mixed findings of success and high-profile failures.

CHAPTER 1

INTRODUCTION

1.1 Introduction

Project management is essential in all engineering disciplines, for it is important to improve the growth of organisations and achieve their strategic goals. It is a common misconception that project management is all about organizing tasks and keeping a strict control of schedule and budget, thus not allowing, and even suppressing, creativity and freedom of resourcefulness (Destouni, 2018). This chapter gives a foundation of the study, highlighting the background, problem statement, research objectives, aim of the research, the research objectives which guided the study, and the delimitations faced during the study.

The study builds on the project management book of knowledge, life cycle of civil engineering projects and the life cycle of construction works models. The rest of the thesis is arranged as follows: Chapter 2, details the literature reviewed for this study. Chapter 3 addresses the methodological issues of the study. Chapter 4 provides the data analysis and results. Chapter 5 provides a detailed discussion of the research findings and chapter 6 details the recommendations for further study.

1.2 Background to research

Civil engineering is an engineering profession discipline that is concerned with the design, construction, and maintenance of the physical and naturally built environment, including public works such as roads, bridges, canals, dams, airports, sewage systems, pipelines, structural components of buildings, and railways. Construction management on the other hand focuses on the overall planning, coordination and control of the construction process from start to finish. The objectives of project management are to create a project that meets the client's requirements in terms of budget and schedule, as well as acceptable risk, quality, and safety. Project managers often earn their position by demonstrating effective management of projects of similar value.

Project management outlines undertaking control, utilizing unique knowledge, skills, tools, and strategies to deliver a product in a fixed timeframe. Project management includes undertaking documentation, making plans, tracking, and communication, all with the aim of handing over

work efficiently in the constraints of time, scope, and budget. Civil engineers work as both project and contract managers. This requires the understanding of the project manager on the project, from managing construction, work deliverables to making sure that created tasks run smoothly from preliminary making plans to a successful completion of the project as a whole. Engineering projects are often complex, expensive and high deliverables; engineering project management is important amongst employers and requires a solid understanding of skills. Effective engineering project management is ultimately about collaborating people at all levels and ensuring that all the separate work streams are delivered to specification, completed in a timely manner, within designated budgets, and follow regulatory, legal mandates and required specifications. Project management in engineering is typically of interest to engineers who need to develop comprehensive skills to advance their careers by learning the holistic aspects of bringing a product or program to market successfully.

A broader perspective, business skills and demonstrated use of soft skills like communications and collaboration can set engineers up for future leadership positions. Engineering projects are becoming increasingly complex, and the project management team is subject to the influence of social and environmental constraints together with concerns for the control of natural resources. These and other factors indicate the pressing importance of proper training and education to develop suitable skills in the potential project manager. Engineers are overseers of many projects, however, due to the engineering training background, most of them lack the managerial skills that equip them with the capacity of exercising sound project management. In so doing, the engineer will not have to abdicate important managerial functions to others, often less ably prepared to understand the technological aspects of developing and implementing alternative strategies.

A project manager in engineering should have a solid understanding of the mechanics and skill sets that go into such projects. Equipping engineers with sound project management skills increases the chance of project success thus making them good contract managers as well. This will enable engineers to effectively oversee engineering projects. Project managers are not always engineers in all engineering projects, this causes conflicts within project deliverables and project specifications. It is thus essential for an engineer to be equipped with project management principles in order to study relations between activities and time. A combination of professional civil engineering and project management therefore, guarantees successful project execution.

Project management is of great importance in the field of civil engineering as it helps ensure that projects are completed efficiently, within budget, and according to the specified timeline. In the specific context of Namibia, project management is particularly relevant due to the country's unique challenges and requirements. Namibia has a growing infrastructure sector, with various construction projects taking place across the country. Effective project management is crucial to ensure that these projects are successfully executed, contributing to the development and growth of Namibia's infrastructure. Additionally, Namibia's specific geographical and environmental conditions, such as its arid climate and diverse terrain, require careful planning and management to address potential challenges and ensure the successful completion of civil engineering projects.

Civil engineers in Namibia face several challenges in their work. One of the main challenges is the limited availability of resources and infrastructure in certain areas of the country. This can make it difficult for civil engineers to design and implement projects effectively. Additionally, Namibia's harsh climate and geographical conditions, such as desert areas and flood-prone regions, pose unique challenges for civil engineering projects. Another challenge is the need to adhere to strict environmental regulations and sustainability practices. Civil engineers in Namibia must also navigate the complexities of working with different stakeholders, including government agencies, local communities, and private sector entities. Finally, there is a shortage of skilled civil engineers in Namibia, which can further hinder the successful implementation of projects.

Project management practices can be highly effective in addressing the challenges faced by civil engineers in Namibia. By implementing efficient project management techniques, civil engineers can better plan, organize, and control their projects, ensuring that they are completed on time, within budget, and to the required quality standards. This helps to minimize delays, cost overruns, and rework, which are common challenges in the field. Additionally, project management practices enable effective communication and collaboration among team members, stakeholders, and contractors, leading to improved coordination and problem-solving. Overall, project management practices play a crucial role in enhancing the efficiency, productivity, and success of civil engineering projects in Namibia.

This research therefore studied the impact of project management to civil engineers in Namibia and highlights the potential benefits of studying the impact of project management on civil engineers in Namibia.

1.3 Problem statement

Engineering project management involves the identification of project goals and milestones as well as the development of multiple scenarios and contingency plans. It's an important process for any engineering team because otherwise, the unexpected can arise and derail the work of dozens or even hundreds of people. The project manager assigns responsibilities to each member of the team and establishes a time limit for completing the tasks. As the team works, the project manager oversees the progress and allocates resources as needed.

Namibia tops the list of the best road networks in Africa (Myles, 2023), however, there has been cases of delayed progress in road construction mainly because of missing timelines in completion or the during project planning project managers overestimated to timelines in material and water prospection. This leads to extended times in project completion thus incurring extra costs in paying contractors for their plants and equipment while they stand still waiting for such prospections. Engineering project management skills are broadly applicable and in high demand. It was evident during COVID-19 pandemic when the world changed around overnight and what had previously been successful no longer worked. Engineering and project management skills helped people to identify new approaches based on the underlying engineering and economic principles.

Organisations use different approaches to respond and deal with works during execution of projects. Some of the organisations might be well-prepared to deal with it as a part of project, whereas, others might be uninformed about it. Understanding the importance and role project management in engineering is crucial but it needs to be first understood especially how organisations perceive and handle it. The researcher is of the view that most contracts are inflated in terms of costs and completion periods mostly caused by a lack of project management knowledge. Project managers plan, direct, and coordinate the development and implementation of small and large-scale projects, products or services. Putting these into perspective, the projects have a defined scope, budget and schedule, this with a sound engineering knowledge result in success of project execution.

Project management skills and concepts can be an asset to any engineer, even when an engineering project management role is not in pursuit. Contract managers in engineering often do not know how to lead a project successfully through constraints, while fostering creativity at the same time. The absence of such flexibility entails that project management is not fully applied to the needs of the engineering field, and neither of the disciplines can reach its full potential (Destouni, 2018). It is against this background that this research sought to assess the role of project management in civil engineering with a case study on Roads Authority in Namibia.

1.4 Research Objectives

Derived from this aim are the following objectives:

- (a) To assess the knowledge to which the Roads Authority civil engineers practice project management in managing their projects in Namibia.
- (b) To establish the perception of Roads Authority civil engineers on the impact of project management in the construction sector in Namibia.
- (c) To identify challenges encountered by the civil engineers in the implementation of the project management skills in Roads Authority, Namibia.
- (d) To establish strategies that can be employed to effectively improve the implementation of project management in construction projects by civil engineers in Roads Authority, Namibia.

1.5 Research Questions

- (a) To what extent do the civil engineers at the Roads Authority practice project management in their projects?
- (b) What is the perception of civil engineers at the Roads Authority on the impact of project management in engineering?
- (c) What challenges do the civil engineers encounter in the implementation of project management skills in projects?
- (d) What strategies can be employed for civil engineers to effectively improve the implementation of project management in projects?

1.5 Aim of Research

The main aim of this study was to assess the impact of project management in engineering with civil engineers in Roads Authority as a case study. The study is significant in that, civil engineers are the managers of the projects, project management implementation is essential to ensure sustainable growth of a nation`s economy and to create extensive linkages within the economy through success of project implementation. Should the civil engineers effectively adopt project management, their projects will be successful and meet their functional aim within the planned time. The findings of the research will add knowledge to project management importance in engineering as a concept and also to the existing academic world for further studies.

1.7 Limitations, scope and delimitations

The purpose of the study was to assess the impact of project management on civil engineers especially in the construction industry. The study only used one method of data collection which was face-to-face interviews, however, data saturation was reached which means that in depth information were collected. The study used a case study of one company in the construction sector and resources to collected data, as such one data collection method was used. Despite these, qualitative interviews were carried out which gives in-depth information on the topic. Due to the use of one company which is dominant in this sector in this study in Namibia, this allows for findings to be generalized to the industry. It is expected that many organisations in other industries can be positioned along the same understanding of project management concept and hence the effects it would have on projects. The results of the study could provide reasonable justification for generalisation in the whole county.

The limitations were addressed by:

1. Having key informants review draft case report to increase contrast validity.
2. Use an interview guide and probes to allow for theoretical generalisation, thus increasing the external validity.

1.9 Definition of terms

TERM	DEFINITION	SOURCE(REF)
Civil Engineering	The practice of designing and developing infrastructure objects, on a large scale, developing nationwide transport systems or water supply networks, or on a more minor scale, developing roads and buildings, for example.	(Amrit & Pardeep, 2020)
Project management	The application of knowledge, skills, tools, and techniques to project activities to meet the project requirements. The planning and organization of an organization's resources in order to move a specific task, event or duty toward completion	(Saiful, 2022)
Contract Management	The process of managing contracts and agreements related to construction projects. It involves overseeing the negotiation, execution, and administration of contracts between the project owner and various parties involved, such as contractors, subcontractors, suppliers, and consultants. This includes ensuring that all parties fulfil their contractual obligations, monitoring project progress, handling any changes or disputes that may arise, and ensuring compliance with legal and regulatory requirements. Effective contract management is crucial for the successful completion of civil engineering projects.	(Bartsiotas, 2014)
Engineering Project Manager	Engineering project management is a specialized process for optimizing the development of new products, technologies or procedures. Engineering's project management techniques are similar to those from other fields and involve planning, execution, monitoring and controlling stages.	(Bhat, 2023)

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter states the theoretical and conceptual frameworks by which the study was guided, as well as the summary of the literature related to the impact of project management in civil engineering.

2.2 Theoretical Framework

2.2.1 Project Management Book of Knowledge (PMBOK)

To assess the impact of project management on civil engineering, it is important to understand the underlying theories that model and explain its process, which initiates, guides, and maintains goal-oriented results. The research borrows mainly from Project Management Book of Knowledge (PMBOK) Guide, which includes the standard for project management. The standard is the foundation upon which the vast knowledge builds, and the guide serves to capture and summarise that knowledge. This guide was used to build on to the study. A theoretical framework provides a broad set of ideas with which a study belongs to (Adom et al., 2018). It is built upon existing theories and researches. Figure 1 below is an extension of the existing theories that support project management.

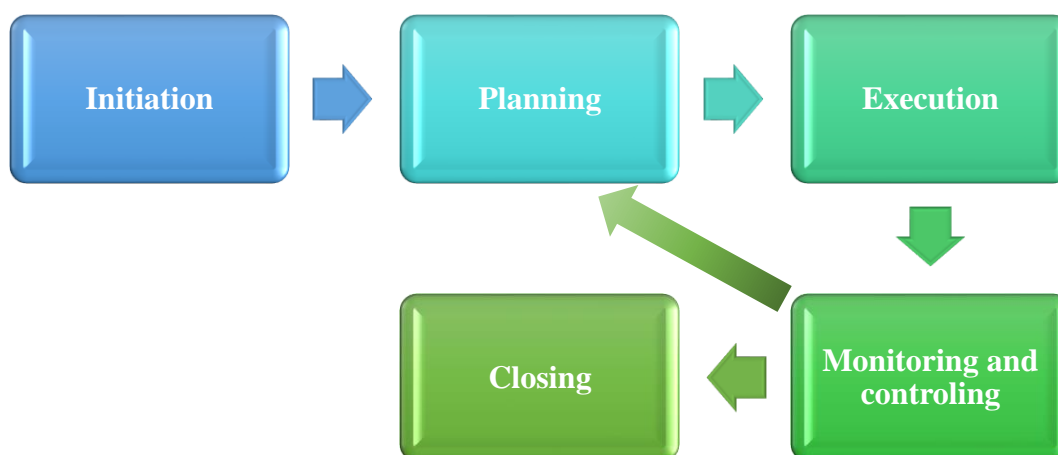


Figure 1 Researcher’s summarized PMBOK Process flow

Project management assimilation deals with effectively integrating the various project management knowledge areas across the project life cycle (Initiation, Planning, Execution and Closing), in order to successfully accomplish project objectives. Integration ensures that the various elements of the projects are properly coordinated. Ten core knowledge areas of project management are identified in PMBOK. These are: integration, scope, time, cost, risk, quality, human resources, communications, and procurement and integration management. Each knowledge area in PMBOK is composed of processes that are expected to be addressed to attain the objective of the knowledge areas. A total of 44 project management processes are identified in PMBOK for the nine knowledge areas. Management of projects is accomplished through the use of the above 44 processes. However, all the 44 processes are not meant to be performed uniformly in the management of all projects. The project manager and the project teams need to decide which processes to employ, and the degree of rigor that will be applied to the execution of those processes.

According to Landau, (2023), the PMBOK knowledge areas can be explained as below:

a) Project Integration Management

This is defined as the framework that allows project managers to coordinate tasks, resources, stakeholders, changes and project variables. Project managers can use different tools to make sure there are solid project integration management practices in place. For example, the project management plan is important for project integration because it works as a roadmap for the project to reach a successful end. Once created, the project plan is approved by stakeholders and/or sponsors before it's monitored and tracked by the project management team.

b) Project Scope Management

Project scope management is one of the most important project management knowledge areas. It consists of managing the project scope, which refers to the work that needs to be executed in a project. To manage the project scope, you'll need to build a project scope management plan, a document where you'll define what will be done in the project. This is done by first writing a scope statement which is anything from a sentence to a bulleted list that's comprehensive to reduce major project risks. Another part of this area is a work breakdown structure (WBS), which is a graphic breakdown of project work. Validate scope during the project, which means making sure that the deliverables are being approved regularly by the sponsor or stakeholder.

This occurs during the monitoring and controlling process groups and is about accepting the deliverables, not the specs laid out during planning. The scope statement is likely going to change over the course of the project to control the scope, such as if a project falls behind schedule.

c) Project Time Management

This knowledge area involves estimating the project duration, creating a project schedule and tracking the project team's progress to ensure the project is completed on time. To do so, the first thing to do is to define the project scope to identify the tasks that should go into the project schedule. Those project tasks are then put in an order that makes sense, and any dependencies between them are noted. These dependencies are then determined to be either finish-to-start (FS), finish-to-finish (FF), start-to-start (SS) or start-to-finish (SF). This is mostly for larger projects. With the tasks now sequenced, the project resources required for each must be estimated and assigned. The duration of each task is also determined at this point. All of this leads to a schedule by first determining the critical path and float for each task. Project management tools like Gantt charts, kanban boards or project calendars are usually used to place the tasks on a timeline, and then work on resource leveling to balance resource usage. Once the project schedule is made, plans to control the schedule are necessary. Earned value management is performed regularly to make sure that the actual plan is proceeding as planned.

d) Project Cost Management

This project management knowledge area involves estimating project costs to create a project budget. Here, cost-estimating tools and techniques are used to make sure that the funds cover the project expenses and are being monitored regularly to keep stakeholders informed. As with other project management knowledge areas, the cost management plan is the document where the method to establish the budget is explained, which includes how and if it will change and what procedures will be used to control it. Each project task will have to be estimated for cost, which means including all resources such as labour, materials, equipment and anything else needed to complete the task. Once all of the task costs are combined, this determines the project budget. Then comes the need to control those costs by using project management tools.

e) Project Quality Management

A project is a failure if it is not up to standard. This means that quality management is one of the most critical project management knowledge areas. The project management plan should include a quality management plan section that specifies the quality control and quality assurance guidelines for your project. Engineering quality standards are set or based on the governing body. Therefore, to control quality, the deliverables must be inspected to ensure that the standards outlined in the quality management plan are being met.

f) Project Human Resource Management

The project team is your most important resource, so it's crucial to assemble the best team and make sure they're happy. But also, there is a need to track their performance to ensure that the project is progressing as planned. A human resource management plan identifies the roles and requirements for those positions, as well as how they fit into the overall project structure. Once the job descriptions are determined, it's time to fill those positions and acquire a project team. This can be done in-house by drawing from other departments in the organization, getting new hires or a combination of both. The team needs development, possibly training and other things that'll make them viable for the project. Managing the project team is an ongoing responsibility of the project manager. The team is monitored to make sure they're working productively and that there are no internal conflicts, so everyone is satisfied.

g) Project Communications Management

All knowledge areas of project management are important, but communication management might be paramount as it informs every aspect of the project. Communications inform the team and stakeholders, therefore the need to plan communications management is a critical step in any project. It's at this point that the dissemination of communications is determined, including how it's done and with what frequency. Target who needs what and when. Also, note how communications will occur when issues such as changes arise in the project. Manage the communications when the project is executed to make sure it runs as planned. This also involves controlling communications by reviewing their effectiveness regularly and adjusting as needed.

h) Project Risk Management

Risk management plans identify how the risks will be itemized, categorized and prioritized. This involves identifying risks that might occur during the execution of the project by making a risk register. Qualitative risk analysis is performed after the biggest risks have been identified and classified by likelihood and impact, then prioritized. Quantitative analysis according to their impact on the project is then performed, such as its budget, schedule, and so on. Risk responses need to be planned in case the risks become cases. Controlling risk involves regularly reviewing the risk register and crossing off those risks that are no longer going to impact the project.

i) Project Procurement Management

This project management knowledge area deals with outside procurement, which is part of most projects, such as hiring subcontractors. This will impact on the budget and schedule. Planning procurement management starts by identifying the outside needs of the project and how those contractors will be involved. Procurements can be conducted by hiring the contractors, which includes a statement of work, terms of reference, request for proposals and choosing a vendor. The procurement process needs to be controlled by managing and monitoring, and then closing the contracts once the work has been done to everyone's satisfaction.

j) Project Stakeholder Management

Stakeholders must be actively managed like any other part of the project. The stakeholders must be happy, as the project has been created for their needs. To start, identify the stakeholders through stakeholder analysis and find out what concerns they have. It's not always easy, but it's a crucial part of starting any project. Plan a stakeholder management, which means listing each stakeholder and prioritizing their concerns and how they might impact the project. This will lead to managing stakeholders' expectations to make sure their needs are met and that you're in communication with them. Stakeholder engagement should be controlled throughout the project by determining if the stakeholders' needs are being addressed. If not, figure out what changes need to be made to either satisfy those needs or adjust the expectations.

2.2.2 Life cycle of civil engineering projects

Civil engineering projects go through a number of stages as shared by Garg, (2020) and depicted in figure 2 below.

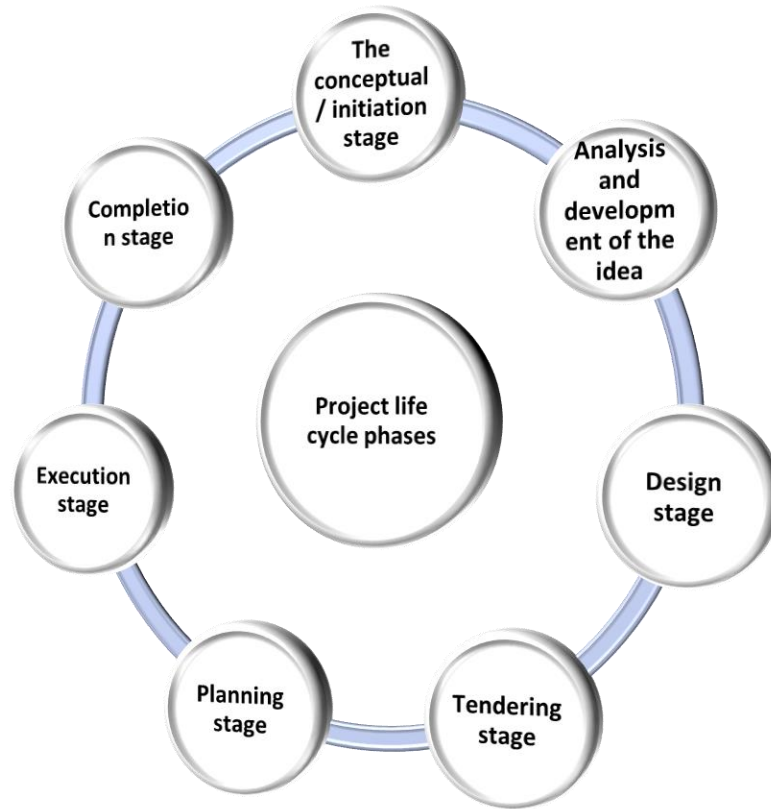


Figure 2 Project life cycle phases of construction/civil engineering project

Source: (Garg, 2020)

The project undergoes 7 phases namely, the initiation, analysis and development of idea, design, tendering, planning, execution, and finally completion stage.

2.2.3 Life cycle of construction works

Life cycle assessment (LCA) is considered as a tool for sustainability assessment in civil engineering. As such, it takes a life cycle perspective when evaluating environmental impacts of a product or a system. This means to consider multiple stages of the life cycle.

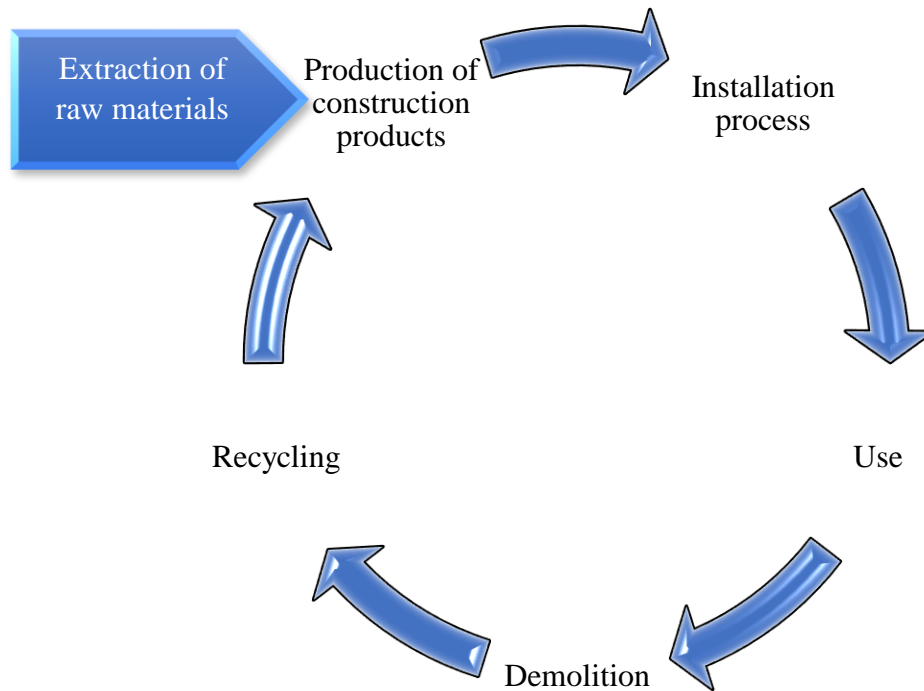


Figure 3 Life cycle construction works

Source: Eriksson, (2019)

For construction works, as seen in Figure 4 above, it could mean to not only consider the use-stage of the construction, but also the industrial and agricultural processes prior to the delivery of the building materials, as well as demolition of the construction and reuse/recycling of the materials (Eriksson, 2019). A sample example in regard to the Namibian Roads Authority starts with an extraction of raw gravel and water as raw materials. The gravel is dumped on site as product installation, and as an installation procedure, water and gravel are mixed together with compaction, and a finished road is used. After the planned lifespan has expired, the road pavement layers can be destroyed and the usable elements recycled for reuse.

The life cycle perspective of LCA allows for comparison of various environmental impacts of systems made up of different processes and multiple use of resources. It can also identify and prevent burden shifting between different stages in the life cycle (Francart, 2021). Otherwise, substituting one stage in a process could unintentionally create possibly larger environmental impacts in other processes in the life cycle.

To consider the whole life cycle of a product or system refers to a "cradle to grave" LCA. It may also be cases where it is motivated to only consider parts of the life cycle, called "cradle to gate"(Eriksson, 2019). The life cycle perspective may also be a limitation as it requires simplifications while modelling the system and building the framework for the LCA. These simplifications prevent the LCA of calculating actual environmental impacts and are also aggregated over time and space (Francart, 2021). Therefore, it is more accurate to say that LCA calculates impact potentials. Another limitation for LCA is that it cannot tell whether the results are "good enough" (Francart, 2021). LCA can allow for comparison between different products but it does not conclude that the product is environmentally sustainable.

2.3 The conceptual Framework

2.3.1 Project Integration Management

The race to create a business value and to sustain competitive advantage has organisations turning to project management (Samans & Nelson, 2022). Project management is seen to play a critical role as a key enabler of organisational strategy. Project management integration deals with effectively integrating the various project management knowledge areas across the project life cycle (Initiation, Planning, Execution and Closing), in order to successfully accomplish project objectives (Regent Business School, 2018).

Integration ensures that the various elements of the projects are properly coordinated. It involves making trade-offs among competing objectives and alternatives to meet or exceed stakeholder needs and expectations. The main project integration management tasks include: the development of the project charter; the development of a project management plan; directing and managing project execution; monitoring and controlling project work; performing integrated project change control; and closing project or phase (Regent Business School, 2018). The key deliverables include the project charter, project plan, change requests and status reports.

The six processes engaged during integration and what they entail are shown in Table 1 below:

Table 1 Integration process stages

Task order	Project integration management tasks	What it entails/description
First	Development of project charter	Initiates project and authorises project to get underway.
Second	Development of the project plan	Includes the project charter, the definition of the project, project objectives, the project budget, the project schedule, the resources required for the project, the approach, management plans, and the initial risk assessment.
Third	Directing and monitoring of project execution	Items produced during this phase include the final deliverable product
Fourth	Monitoring and controlling project work	Change management. Requests for project change may be made during the project lifecycle. If these requests are not monitored and controlled, then the quality budget, schedule and success of the project may be negatively impacted.
Fifth	Control of integrated change	Ensures that each change proposed during a project is carefully and adequately defined, reviewed and approved before implementation. The process helps avoid unnecessary changes that might disrupt services and also ensures the efficient use of resources.
Sixth	Closing project or phase	Upon completion, approval signatures should have been obtained and final invoices paid. This stage also involves reviewing the processes, successes and deficits that were encountered during the project lifecycle which informs the “lessons learned” document produced by the project management team.

Source: Researcher’s representation of descriptions given by the Regent Business School, (2018).

Project integration management is by far the most important role in any project as it helps project managers to integrate all activities crucial to project success.

2.4 Related literature

2.4.1 Project and project management

Many authors and references have defined a project in different ways emphasizing its different aspects. Summarizing those definitions given, this research defines a project as: A temporary endeavour (that has definite beginning and end time) undertaken following specific cycle of Initiation, Definition, Planning, Execution and Close to create a unique product, service, or result through novel organization and coordination of human, material and financial resources (Kissflow Inc, 2023). Similarly, project management as the application and integration of modern management and project management knowledge, skills, tools and techniques to the overall planning, directing, coordinating, monitoring, and control of all dimensions of a project from its inception to completion, and the motivation of all those involved to produce the product, service or result of the project on time, within authorized cost, and to the required quality and requirement, and to the satisfaction of participants (Anantatmula, 2020). Project management deals mainly with coordinating resources and managing people and change. Managing a project includes identifying requirements, establishing clear and achievable objectives, balancing the competing demands for quality, scope, time and cost; adapting specifications, plans, and approach to the different concerns and expectations of the various stakeholders.

Extant project management literature that examines the factors that impact the success rate of projects suggests that the influence of traits, leadership style and competencies of project managers on project success remains an under researched area (Sandhu & Sahil, 2018). Acceptance of diverse project management skills has significant consequences for both (professional and academic) fields. Cohesive project teams should create a leadership and authority structure to integrate functional elements, skills and discipline into a cohesive whole, to achieve the goals of the project (Xue et al., 2020). The project team's key role is not to do the job but to organize the decision process, while the project manager's role in recognizing sustainability includes technical competencies (Xue et al., 2020). Incorporation of project management into projects results into different aspects such as innovation hence, a new way of

doing things to ensure success. Innovation describes both a mechanism and an outcome. Project management has a special connection to handling innovation, so that most creative tasks are performed by the project manager. Innovation project processes also involve a gated mechanism designed to promote creative projects, with increased rates of monitoring as funding rises over the lifecycle of the project.

2.4.2 Engineering management and engineering project management

Engineering management and engineering project management are related but distinct fields. Engineering management focuses on the overall management of engineering projects and teams, including aspects such as budgeting, resource allocation, and strategic planning. It involves overseeing the entire engineering process, from conception to completion. On the other hand, engineering project management specifically deals with the planning, execution, and control of engineering projects. It involves coordinating and managing the various tasks, resources, and stakeholders involved in a specific project to ensure its successful completion within the given constraints of time, cost, and quality. Hence, engineering management is a broader field that encompasses the management of engineering projects, while engineering project management is a more specialized discipline that focuses on the management of individual engineering projects.

In the same vein, engineering management and engineering project management are different roles but leverage many of the same skills and experience. Many engineers will hold both of these roles over their careers. An engineering manager is responsible for managing groups of engineers, while an engineering project manager leads a cross-functional project team. The project manager's focus is on the business value that will be delivered by the project. The engineering manager is focused on the professional development of their engineers. Both the engineering manager and the engineering project manager need education and work experience in engineering. Engineering managers and engineering project managers can come from any engineering field. Engineering managers manage engineers from many different disciplines. Engineering project managers lead projects in every industry.

Engineering project manager's roles can happen at many different levels of an organization's hierarchy or reporting structure, whereas engineering managers are typically found between mid-management and executive-levels (Bhat, 2023). For example, project managers for small,

short-term projects can be early career individual contributors where the project manager role is an opportunity to lead a team and develop additional leadership skills. As an engineer has success in project management, s/he will be trusted and rewarded with larger and more complex projects (Xue et al., 2020). The project develops a specific approach, from conception through to execution and eventual value realization. Innovation is critical for the economic health of the developed world; innovation can be credited to as much as half of all GDP (Gross Domestic Product) growth (Xue et al., 2020). A manager who wants to guide and direct the important processes of innovation needs to be or become an innovative project manager with notable leadership skills. Conversely, project managers for large, mega-projects can be at an executive level in the organization and have a team of hundreds.

Engineering project managers can facilitate the successful completion of engineering projects. They often combine their technical engineering skills with project management techniques to create a comprehensive project plan and keep a project progressing (Bhat, 2023). Some benefits of engineering project management include: improved coordination of shared resources; more accurate cost assessments; less overall spending; improved teamwork and communication; and increased efficiency (Bhat, 2023).

2.4.3 The importance of project management for civil engineers

To cope with an ever-increasing population, pressure on land, and growing economic activity, construction projects are in increasing demand and activities are booming in many countries (Haron et al., 2018). The construction industry is vital since rapid economic development has increased the demand for construction of infrastructure and facilities around the globe. The construction industry also provides the basic living conditions for the sustainability and development of human life on the earth. More also, projects and initiatives are implemented to ensure sustainable growth of nation economy and to create extensive linkages within the economy. To implement these projects successfully and to meet the functional aim of the projects within their service time, an efficient project management practice needs to be adopted from the planning stage to end. Frequently, those that are involved in the project handling, fail to take a proactive approach to overcoming the uncertainties (Haron et al., 2018). As a result of this, project delays and budget overruns are usually encountered due to an overlook of potential risk. Insufficient information and ineffective management of project not only caused project

cost overrun, completion delays but also termination before completion and negatively impact the project team's reputation. To improve the chance of success and reduce the potential failures, the success criteria, and uncertain factors should be carefully identified, assessed and monitored

Civil engineers have been reported to work more in the management aspect of a construction project (Winiarski et al., 2019). As such, civil engineers commonly play their roles predominantly under the managerial perspective. A civil engineering project is a complex engineering project involving multiple fields and multiple operations. The management content related to this project includes project construction quality, project construction and development progress, expenditure costs in various stages of project implementation, work safety, etc (Lixiang, 2022). Technicians need to cooperate with on-site management personnel to do the above work and implement the management and control of each link in order to ensure that the project achieves the expected effect after completion, and construction party can get the due benefits after the completion of the settlement (Lixiang, 2022).

2.4.4 Civil engineers' perception of project management

Civil engineers play a critical role in the construction sector, and their perception of project management is essential. According to a survey conducted by the Construction Industry Institute (CII), civil engineers believe that project management is essential for the success of construction projects (Adekunle et al., 2022). The survey found that civil engineers perceive project management as a critical factor in improving project performance, reducing costs, and enhancing quality. Civil engineers are responsible for designing, constructing, and maintaining infrastructure such as roads, bridges, buildings, and water systems. Project management is a critical aspect of their work, as it ensures that projects are completed on time, within budget, and to the required quality standards. Civil engineers must define the project scope, objectives, and deliverables. They must also identify the resources required, such as materials, equipment, and personnel (Adekunle et al., 2022). A project schedule is then developed, outlining the tasks that need to be completed and their timelines.

Risk management is also an important aspect of project planning, as civil engineers must identify potential risks and develop strategies to mitigate them (Crispin, 2018). Once the project plan is in place, civil engineers begin project execution. This involves coordinating resources, managing schedules, and monitoring progress. Communication is critical during this phase, as

civil engineers must keep stakeholders informed of progress and any issues that arise. They must also ensure that work is being completed to the required quality standards. During project execution, civil engineers must monitor progress and control the project to ensure that it stays on track. This involves tracking progress against the project schedule, identifying any deviations from the plan, and taking corrective action when necessary. Quality control is also an important aspect of project monitoring and control, as civil engineers must ensure that work is being completed to the required standards (Ansah & Zhang, 2019). Once the project is complete, civil engineers must close out the project. This involves verifying that all work has been completed to the required standards and that all deliverables have been provided. Lessons learned are also documented during this phase, which can be used to improve project management practices in future projects. Project management is a critical aspect of civil engineering work. By following these practices, civil engineers can ensure successful project delivery and improve their project management skills over time.

Despite the importance of project management in construction, there are several challenges that civil engineers face. One of the main challenges is the lack of effective communication between stakeholders. Poor communication can lead to misunderstandings, delays, and cost overruns (Al Khattab et al., 2015). Another challenge is the complexity of construction projects, which can make it difficult to manage resources effectively (Muniba et al., 2023). Civil engineers also face challenges related to project planning and scheduling (Alameri et al., 2021). In some cases, projects are not adequately planned or scheduled, leading to delays and cost overruns. Finally, civil engineers face challenges related to project risk management. Construction projects are inherently risky, and effective risk management is essential to ensure project success. To overcome these challenges, it is essential to have effective project management processes in place and to ensure that all stakeholders are involved in the project from the planning stage to the commissioning stage.

2.4.5 The impact of project management on civil engineering projects

Project management can be a powerful tool to help civil engineering work become more efficient, cost-effective, and successful. When project managers are involved in the process, they bring their expertise in organization, budgeting, and planning to the table, allowing for

better coordination between different teams working on a project and ensuring that tasks are completed on time and within budget.

The impacts of project management on civil engineering work are extensive and significant. Project management plays a crucial role in ensuring that construction projects are completed efficiently, within budget, and according to predetermined timelines (Tsinarakis et al., 2023). One key impact is improved coordination and communication among various stakeholders involved in civil engineering projects. Project managers facilitate effective collaboration between architects, engineers, contractors, suppliers, and other key members of the project team, which helps to reduce costs and improve the quality of the final product (Tsinarakis et al., 2023).

Project management plays an important role in civil engineering work, as it helps to ensure that projects are completed on time and within budget and according to specifications (McNeil, 2023). By establishing a framework for organizing the tasks necessary to complete a project, project management can help reduce costs associated with delays or errors. Additionally, it assists in ensuring that all stakeholders involved are kept informed of progress and held accountable for their contributions. By effectively managing resources, schedules, and risks, project management helps minimize delays, cost overruns, and quality issues (McNeil, 2023).

One impact of project management on civil engineering projects is improved coordination and communication among various stakeholders, such as architects, engineers, contractors, and clients (Elmezain et al., 2021). Project managers facilitate effective collaboration, ensuring that everyone is on the same page and working towards a common goal. The authors further stated that project management helps in identifying and managing risks associated with civil engineering projects. This includes assessing potential hazards, developing contingency plans, and implementing risk mitigation strategies. Also, by proactively addressing risks, project managers can minimize the likelihood and impact of unforeseen events (Elmezain et al., 2021). Furthermore, project management enables efficient allocation of resources, such as labour, materials, and equipment. By carefully planning and scheduling activities, project managers can optimize resource utilization, reducing waste and maximizing productivity (Elmezain et al., 2021).

Overall, project management brings structure, organization, and control to civil engineering projects, leading to improved project outcomes and client satisfaction.

2.4.6 Challenges encountered by the civil engineers in the implementation of the project management skills

The challenges encountered by civil engineers in implementing project management skills can be quite significant. One common challenge is the complexity of civil engineering projects. These projects often involve multiple stakeholders, intricate designs, and strict regulations (Bhat, 2023). Managing all these aspects can be quite challenging and requires effective project management skills. Another is that, there is often a lack of proper training and education in project management within the field of civil engineering, which leads to a limited understanding of essential concepts and methodologies, making it difficult for engineers to effectively plan and execute projects (Olsson, 2018). Furthermore, the lack of specialized project management software and tools used by civil engineers can be a hindrance, as it can be difficult to effectively monitor and control the various aspects of a project (Adeleke et al., 2019). Another challenge is the dynamic nature of civil engineering projects. These projects often face unexpected changes, such as design modifications, budget constraints, or unforeseen site conditions. Civil engineers need to be able to adapt to these changes and make necessary adjustments to the project plan.

Additionally, resource management can be a challenge in civil engineering projects. Engineers need to allocate resources effectively, including materials, equipment, and labour, to ensure the project stays on schedule and within budget. This requires careful planning and coordination. Communication and coordination among project team members can also be a challenge. Civil engineering projects involve various professionals, such as architects, contractors, and subcontractors, who need to work together seamlessly. Effective communication and coordination are essential to avoid delays and conflicts (Yimam, 2011). Lastly, risk management is a significant challenge in civil engineering projects. Engineers need to identify potential risks, assess their impact, and develop strategies to mitigate them (Binyah & Alotaibi, 2019). This requires a thorough understanding of the project and its potential risks. Overall, implementing project management skills in civil engineering projects can be challenging due to the complexity, dynamic nature, resource management, communication, coordination, and risk management involved (Jawdat & Khalid, n.d.).

2.4.7 Strategies employed by civil engineers to effectively improve the implementation of project management

Civil engineers employ various strategies to effectively improve the implementation of project management. Some of these strategies were outlined by (Horning, 2018) as follows:

1. **Clear Communication:** Civil engineers ensure effective communication among team members, stakeholders, and clients. This helps in setting clear expectations, resolving conflicts, and ensuring everyone is on the same page.
2. **Proper Planning:** Civil engineers develop comprehensive project plans that outline the scope, schedule, budget, and resources required for successful project execution. This helps in identifying potential risks and challenges beforehand and developing mitigation strategies.
3. **Risk Management:** Civil engineers employ risk management techniques to identify, assess, and mitigate potential risks that may impact the project. This involves conducting risk assessments, developing contingency plans, and regularly monitoring and updating risk registers.
4. **Stakeholder Engagement:** Civil engineers actively engage with stakeholders throughout the project lifecycle. This includes regular communication, addressing concerns and feedback, and involving stakeholders in decision-making processes. This helps in ensuring stakeholder satisfaction and alignment with project goals.
5. **Continuous Monitoring and Control:** Civil engineers implement robust monitoring and control mechanisms to track project progress, identify deviations from the plan, and take corrective actions. This involves regular project status updates, performance tracking, and adherence to quality standards.
6. **Team Collaboration:** Civil engineers promote effective collaboration among team members by fostering a positive work environment, encouraging knowledge sharing, and facilitating teamwork. This helps in enhancing productivity, creativity, and overall project success.
7. **Continuous Improvement:** Civil engineers continuously evaluate project management processes and practices to identify areas for improvement. This involves conducting lessons learned sessions, implementing best practices, and adopting new technologies and methodologies. By employing these strategies, civil engineers can enhance the implementation of project management and improve the overall success of civil engineering projects.

CHAPTER 3

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter outlines the methods that were followed to answer the objectives of the study. The section uncovers the research paradigm, methodology, design, data collection, analysis; reliability and validity of the study, as well as the ethical issues considered in the study.

3.2 Research Paradigm

There are three general approaches that are used in research which includes quantitative approach that correspond to positivism/post-positivism world view, and qualitative approach which is in line with constructivism and transformative world view and mixed method (triangulation) approach which correspond to pragmatism world view (Dawadi et al., 2021). Quantitative approach is generally an approach of measurement and numbers while, qualitative approach deals with words and images, whereas mixed methods approach combines measurements, numbers, words and images (Dawadi et al., 2021). An interpretivism philosophy was used in this study. According to Saunders, Lewis and Thornhill (2019) research philosophy can be referred to the development of knowledge and the nature of that knowledge. This research was done using a descriptive approach, based on interpretivism that strives to comprehend how individuals in everyday settings construct meanings and explain the events of their worlds, it emphasized on experience and interpretation (Saunders et al, 2019). It is against this background that this study adopted an interpretivism philosophy because it allows the researcher to acquire a comprehensive cognizance into the lives of participants and to attain an empathetic understanding of why they act in the way they do. Hence enabled the researcher to interpret the participants' views and experience on the impact of project management in engineering, with a case study on Roads Authority. An interpretative paradigm allowed the researcher to see things from the eyes of the subjects being studied and to understand and interpret what the subject is thinking or the meaning the subject is making of the context (Napwadza, 2021).

3.3 Research Methodology

This study used a qualitative approach to collect data as it deals with the collection of a vast descriptive data (Melnikovas, 2018). Qualitative research is the study of the nature of phenomena, which includes their quality, different manifestations, the context in which they appear, or the perspectives from which they can be perceived, but excludes their range, frequency, and place in an objectively determined chain of cause and effect (Ugwu & Eze, 2023). In practice qualitative research typically includes data in the form of words instead of numbers. To better understand ideas, opinions, or experiences, qualitative research involves gathering and analyzing non-numerical data (such as text, video, or audio). It can be used to uncover intricate details about a situation or to spark fresh research concepts (Ugwu & Eze, 2023). Without outstanding the above, qualitative research is used to comprehend how individuals perceive their surroundings. Although there are numerous approaches to qualitative research, they all share a tendency to be adaptable and a focus on preserving rich meaning when interpreting data. Grounded theory, ethnography, action research, phenomenological research, and narrative research are examples of common methodologies (Ugwu & Eze, 2023). Despite some similarities, they emphasize various goals and viewpoints.

Qualitative research is especially appropriate for answering questions of *why* something is (not) observed, assessing complex multi-component interventions, and focussing on intervention improvement (Busetto et al., 2020). The most common methods of data collection are document study, (non-) participant observations, semi-structured interviews and focus groups. For data analysis, field-notes and audio-recordings are transcribed into protocols and transcripts, and coded using qualitative data management software. Criteria such as checklists, reflexivity, sampling strategies, piloting, co-coding, member-checking and stakeholder involvement can be used to enhance and assess the quality of the research conducted (Busetto et al., 2020).

The qualitative, narrative approach was chosen to describe and analyse the impact of project management in engineering. This approach is used to probe deeply into the research setting, to obtain in-depth understandings about the way things are, why they are like that and how participants perceive them (Rashid et al., 2019). This approach was relevant to collect data about the phenomenon as well as answer the research questions of this study as this approach allowed the participants' natural setting to provide a holistic understanding of civil engineers on project management, through interpretive process; which would be difficult to obtain using other research approaches (Dawadi et al., 2021). Another reason for choosing qualitative

approach was that it enabled the researcher to analyse individual and collective social actions, beliefs, thoughts and perceptions from the participants (Akyıldız & Ahmed, 2021).

Limitations of using qualitative approach are time consuming and may be researcher biased since the researcher is subjectively involved in the collection, analysis and interpretation of the data (Alamri, 2019). However, Subedi, (2021) asserts that the purpose of the research, methodological choices, theoretical framework and analytical strategy, data saturation, researcher's knowledge and experience, and institutional and supervisor's requirements need to be considered while choosing the participants in qualitative research.

3.4 Research Design

A research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure (Thakur, 2020). The research design is the conceptual structure within which research is conducted; it constitutes the blueprint for the collection, measurement and analysis of data. The research design is intended to provide an appropriate framework for a study (Thakur, 2020). A very significant decision in research design process is the choice to be made regarding research approach since it determines how relevant information for a study will be obtained (Sileyew, 2019). Different researchers define research design differently but have some commonalities. Research design is therefore a master plan specifying the methods and procedure for obtaining and analyzing the needed information in research. A research design communicates information about the key features of the study. One of such a feature is that at one or more points in the research process data is collected (numbers, words, gestures, etc.), although in diverse ways and for different purposes.

Common qualitative research designs include case study, phenomenology, narrative, and ethnography (Horning, 2018). Therefore, in order to achieve the objectives of this research, a qualitative research design was adopted whereby an open-ended interview guide was employed as the research instrument. Qualitative approach provides a chance for the researcher to gain deeper and clear understanding of participants' perceptions and experiences through interviews (Aspers & Corte, 2019). The same method was employed in this study to assess the impact of project management in engineering.

3.5 Methodology

The study used a single case selection from one company using purposive sampling. Roads Authority (RA) is a body that regulates and supervises engineering projects which pertain to roads construction. The role of RA is to construct and maintain Namibia's road network through supervision of projects, which are ensured to client specificity. In other words, RA is the custodian of the Namibia road network. The study followed a qualitative research methodology because the topic under study require explanations to patterns relating to the extent of incorporation of Project management in civil engineering projects and the need to have detailed understanding of the issue, which can only be established by talking directly with the people, in their space and allowing them to tell express themselves. Consequently, the approach allows participants to share their stories hence the power relationships that often exist between the researcher and the participants is minimised to better understand the behaviours, beliefs, opinions and emotions from the perspective of the study participants. The approach was also used to get in-depth views on questions and have immediate follow-up questions to the issues at hand. The researcher carried out interviews until data saturation was reached.

3.5.1 In-depth interview

Interviews have been described as one of the most widely employed data collection methods, especially within qualitative research (Coleman, 2019). Interviewing is 'a basic form of human activity in which language is used between two human beings in the pursuit of cooperative inquiry' (Gray, 2018, p.379). The use of more loosely structured and sometimes termed in-depth or semi-structured interviews within qualitative research are more specifically designed to 'learn what another person knows about a topic, to discover and record what that person has experienced, what he or she thinks or feels about it, and what significance or meaning it might have' (Coleman, 2019, p.2). Further to these, the interview is an important research tool because skilful, sensitive and insightful interviews generate 'a rich set of accounts of the interviewee's experiences, knowledge, ideas and impressions' (Roberts, 2020, p.2) and facilitate understanding of individuals' public and private lives as well as their thoughts and emotions (Coleman, 2019; Lavee & Itzchakov, 2021). Interview-based research may also enable the development of new frameworks and theories to explain human behaviour. In-depth

interviewing is a flexible data collection tool, which allows the managed transition from one relevant topic to another (Coleman, 2019).

Roberts, (2020) concurs that qualitative interviewing provides an open-ended, in-depth exploration of an aspect of life about which the interviewee has substantial experience, often combined with considerable insight. Additionally within the scientific community, qualitative researchers are considered naturalists because of their view that reality is ever changing and subjective, and their belief that knowledge should be obtained indirectly through the perceptions of and as interpreted by others (Mezmir, 2020; Roberts, 2020). Because of their stance on what can be known and how knowledge can be obtained, qualitative researchers explore complex situations or processes by asking others, “How did everything unfold?” and “How are the involved variables interacting with one another?” It is assumed that it allows people to learn from each other and that by interacting, reflecting, and reconstructing what was experienced, persons can reach shared meanings and understandings, and therefore acquire insight into the complexities of specific aspects of life (Roberts, 2020; Rutledge & Hogg, 2020). The qualitative interview, therefore, provides a means, through dialog, to work toward making sense of and determining the meaning of specific events, experiences, or phenomena.

3.5.2 Data saturation

Saturation is used in qualitative research as a criterion for discontinuing data collection and/or analysis (Saunders et al., 2018). The concept of data saturation, defined as ‘information redundancy’ or the point at which no new themes or codes ‘emerge’ from data, is widely referenced in thematic analysis research (Braun & Clarke, 2019). Several researchers have sought to ‘operationalise’ data saturation and provide concrete guidance on how many interviews, or focus groups, are enough to achieve some degree of data saturation in thematic analysis research. Data saturation is the conceptual yardstick for estimating and assessing qualitative sample sizes. During the past two decades, scholars have conducted empirical research and developed mathematical/statistical models designed to estimate the likely number of qualitative interviews needed to reach saturation for a given study (Guest et al., 2020). Although this body of work has advanced the evidence base for sample size estimation during the design phase of a qualitative study, it does not provide a method to determine saturation, and the adequacy of sample sizes, during and/or after data collection (Guest et al., 2020).

Saturation is an important component of rigor, therefore, in order to attain data saturation, researchers should consider multiple factors (such as predetermined codes and themes, sample size, relevancy of research subjects (respondents), number of research methods, and length of data collection sessions) that may affect data saturation in order to increase the validity of qualitative studies (Mwita, 2022). As such, participants in qualitative research can be added or removed during the research process rather than the prior determination (Subedi, 2021).

3.6 Data Collection

In-depth interviews formed the main and only data collection method. A research protocol was developed to provide guidance in the data collection process. An interview guide is a list of questions or topics that the interviewer hopes to cover during the course of an interview. It is called a guide because it is simply used to guide the interviewer. The protocol or interview guide covered open-ended questions designed to capture information on the impact of project management in engineering. These interviews were semi-structured hence the researcher had a particular topic about which the participants spoke to and the interviewer liked to hear from the respondent. The questions were not asked in exactly the same way or in exactly the same order to each and every respondent. Since the researcher carried out in-depth interviews, the primary aim was to hear from respondents about what they think is important about the topic at hand and to hear it in their own words as per the set questions. Civil engineers working for Roads Authority whether on permanent or temporary contract were interviewed. Participants were provided with information explaining the purpose of the study along with a letter of consent; then interviews were conducted to collect the necessary data.

3.7 Data analysis

Data analysis is the process of collecting, modeling, and analyzing data using various statistical and logical methods and techniques. Main categories of data analysis may include Narrative data analysis, descriptive data analysis and statistical data analysis (Calzon, 2023). Narrative data analysis is a method associated with qualitative research; it uses field texts such as stories, interviews, letters, conversations, photos, journals, autobiography and field notes as units to analyse for substantiating the ground for the research question (Calzon, 2023; Scheffelaar et al., 2021). Choosing the type of analysing methods should come from combination of factors

such as research questions being asked, theoretical foundation of the study and appropriateness of the techniques for making sense of data (Dawadi et al., 2021). This study adopted a narrative data analysis of qualitative data through thematic analytical approach. Qualitative data analysis is a systematic process of categorizing, coding and interpreting data to provide explanation of the phenomenon under study and answer the research questions (Mezmir, 2020).

Thematic analysis helps in identifying and interpreting patterns in qualitative data. The thematic method analyses large pieces of text data such as focus group transcripts or interviews and groups them into themes or categories that come up frequently within the text (Calzon, 2023). It is a great method when trying to figure out people's views and opinions about a certain topic. For example, it analyses the views and opinions about the impact of project management on civil engineering and how it is applied in their projects or work. The transcripts were analysed to find common issues. Thematic analysis is a very subjective technique that relies on the researcher's judgment (Calzon, 2023). Therefore, to avoid biases, it has six steps that include familiarization, coding, generating themes, reviewing themes, defining and naming themes, and writing up. It is also important to note that, because it is a flexible approach, the data can be interpreted in multiple ways and it can be hard to select what data is more important to emphasize.

In this study, collected data was first classified into clusters based on position and research tools used. Similar responses were merged and grouped together to form categories which was later organised into themes. The data from interviews were transcribed, coded and analysed in an attempt to answer the research questions.

3.8 Reliability and Validity of the study

The quality of the study in terms of reliability and validity of the research were ensured by running tests on dependability, confirmability, credibility, trustworthy, compelling, and usefulness. Trustworthiness in qualitative research refers to the systematic rigor of the research design, the credibility of the researcher, the believability of the findings, and applicability of the research methods (Rose & Johnson, 2020). It is the overall impression of quality associated with a research endeavour. Rose & Johnson, (2020) define trustworthiness as the key element to maintaining the place of qualitative research in the academic world, and there is a general consensus that qualitative inquirers need to demonstrate that their studies are credible. Without

becoming bogged down by the “criteriology” that characterizes swaths of positivist and postpositivist research paradigms and current neoliberal academic trends toward increased accountability, researchers in qualitative inquiry should seek to more deeply substantiate their analyses and claims (Rose & Johnson, 2020). The authors further added that studies that are more trustworthy are de facto more likely to constitute research that makes a difference. They believe that increasing the trustworthiness of a qualitative research study involves multiple aspects, including epistemological understandings, the depth of literature reviewed and engaged, the appropriate theoretical positioning of the argument, selection and deployment of the multiple and often conflicting data collection/generation techniques and analytical procedures undertaken, the connection of empirical material to larger theories and discourses, and the ways in which these aspects of the research are interwoven with one another (Rose & Johnson, 2020).

Qualitative validity means that the researcher checks for the accuracy of the findings by employing certain procedures, while qualitative reliability indicates that the researcher’s approach is consistent across different researchers and different projects (Rose & Johnson, 2020). Reliability refers to the soundness of the research, particularly in relation to the appropriate methods chosen, and the ways in which those methods were applied and implemented in a qualitative research study (Cresswell & Cresswell, 2018). Reliability asks us to question the consistency of the methodological process, hopefully remaining reasonably stable over time and across researchers and/or methods engaged. Providing a justification of the methods used, as well as clarity in the analytical procedures, increases a sense of reliability of a study (Rose & Johnson, 2020). The researcher ensured reliability by addressing the consistency and clarity associated with the actual conduct of the research, thereby increasing the likelihood that other researchers could not only discern but also undertake many of the research methods described (Cresswell & Cresswell, 2018). The researcher also looked at whether a similar research project can be conducted based upon the description provided; the degree to which the project can be replicated; the extent to which similar results and analyses can occur should another study be conducted. Validity refers to the process of determining the fidelity (sometimes understood as accuracy) of the findings from the standpoint of the researcher, the participants, and/or the consumers of the research (Rose & Johnson, 2020).

3.10 Ethical Consideration

Any research must follow ethical principles, particularly when it involves people as participants and is likely to impact them (UK Research and Innovation (UKRI), 2019). Research ethics are a set of principles and guidelines that shape and guide the way any research involving sentient beings (that is, people and animals) is designed, conducted, managed, used and disseminated. In these guidelines, the term ‘research’ is used broadly: it includes diagnostic and explorative investigations of social issues of interest, as well as work carried out as part of Monitoring, Evaluation, Accountability and Learning (MEAL) mandates focusing on specific efforts (intervention, policy, programme) (Mager & Galandini, 2020). Research ethics is a set of principles that assist researchers in deciding how to conduct research, ethically.

The six key principles for ethical research, as outlined by Mager & Galandini, (2020) are: research should aim to maximize benefit for individuals and society, and minimize risk and harm; the rights and dignity of individuals and groups should be respected; wherever possible, participation should be voluntary and appropriately informed; research should be conducted with integrity and transparency; lines of responsibility and accountability should be clearly defined; and independence of research should be maintained and, where conflicts of interest cannot be avoided. This study considered the necessary ethical issues such as voluntary participation, informed consent, confidentiality among others; in the process of collecting and analysing the data. Before the researcher could start with data collection, permissions were obtained from the relevant offices or people such as the Roads Authority and civil engineers from previous and current projects.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

The current chapter focuses on the qualitative data comprising biographical data of the participants in the interviews as well as the emergent themes and subthemes.

Participants in the qualitative section of the research comprised civil engineers from Roads Authority in Khomas Region of Windhoek in Namibia. The participants were described in Chapter 3.

The qualitative findings relate to the objectives of the study which were to:

- To assess the knowledge to which the Roads Authority civil engineers practice project management in managing their projects in Namibia.
- To establish the perception of Roads Authority civil engineers on the impact of project management in the construction sector in Namibia.
- To identify challenges encountered by the civil engineers in the implementation of the project management skills in Roads Authority, Namibia.
- To establish strategies that can be employed to effectively improve the implementation of project management in construction projects by civil engineers in Roads Authority, Namibia.

The civil engineers were included in the study as they are the project managers who are involved in the day-to-day duties in the construction sector. They would therefore be able to provide in depth knowledge with regards to the impact of project management in civil engineering.

4.2 Demographic variables

Six participants of the study were all civil engineers; however, they held different positions based on the departments in which they worked. Four participants were male and three were female. Two participants know of project management by training, while others are knowledgeable through practice.

Table 2 The participants' background information

Participant	Gender	Position	Education History	Involvement
1.	Female	Project control engineer	-Diploma in civil engineering and project management -Bachelors of Technology in civil engineering (project management for construction) -Diploma in project management -Certified associate in project management	Network Development (Construction & Quality Control)
2.	Female	Engineer	- Diploma Civil Engineering - Bachelor of Technology Civil Engineering	Construction & Rehabilitation
3.	Male	Engineering Manager	- Bachelor of Engineering	Roads Maintenance
4.	Male	Senior Civil Engineer	- Bachelor of Engineering - Masters in Geotechnical Engineering	Roads Maintenance
5.	Female	Civil Engineer	- Bachelors of Technology in Civil Engineering	Roads Maintenance
6.	Male	Principal Material Engineer	- Diploma Civil Engineering - Bachelor of Technology Civil Engineering -Master's Degree in Transportation Engineering - PhD in Civil Engineering (enrolled)	Quality control, materials, pavement design, laboratory Services

4.3 The themes and subthemes

The data revealed six themes. The researcher coded the interviews after completing the process of iterative readings of the transcript and listening to the recordings. It was critical to concentrate on the messages that the participants were attempting to convey while keeping in

mind the fundamental aims of the qualitative data. The inherent themes underpinning each interview or segment of an interview frequently emerged from the data during this phase. These major themes were recognized, and groups were organized accordingly. The researcher discovered commonalities and overlapping themes during a second round of coding. For example, nine themes were initially found; however, after a second round of coding and re-checking, six key concepts were altered, resulting in a reduction in the number of themes as displayed in Table 3.

Table 3 Themes and subthemes

Themes	Sub-themes
Importance of Project Management in Civil Engineering	Role of project management in the success of projects
	Need for project management background/knowledge in road construction projects
	Incorporating project management processes/principles and concepts into daily work
Application of project management	Utilisation of the five process groups in project management (initiating, planning, executing, monitoring and controlling, and closing off projects)
Impact of project management	Constraints of project management (time, quality, and scope)
	Miscommunication and lack of understanding in other divisions
	Stakeholder engagement and contractor empowerment in project management
Challenges in Project Management	Resistance to change from team members
	Dependence on other functional legs for project delivery
	Delay in project timelines
Organizational Project Management Model	Proposal for a stand-alone project management leg in the organization
	Sensitise the organization about the importance of time and project management
	Comparison with other organizations that have project management offices (PMOs)
	Unite divisions, stakeholders and contractors to align with PM principles
	Need for contingency planning in uncertain projects

Certification and Qualifications in Project Management	Stakeholders advocating for certified project managers in government projects
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4.4 Importance of Project Management in Civil Engineering

The theme relates to matters underlying the project management and its importance in civil engineering. Five subthemes emerged from the data (see Table 4). One preconceived idea of the researcher was that the civil engineers have most probably been exposed to project management processes through their educational background. The application of the concept is then based on knowledge and experience.

Table 4 Importance of project management in civil engineering

Themes	Sub-themes
Importance of Project Management in Civil Engineering	Role of project management in the success of projects
	Need for project management background/ knowledge in road construction projects
	Incorporating project management processes/principles and concepts into daily work

Role of project management in the success of projects: Most participants indicated that project management is the foundation of all civil engineering projects. The success of every project lies on the civil engineer’s knowledge in project management because there is a project management plan in terms of what needs to be executed at what stage and what needs to be done in terms of quality assurance. It was shared that numerous projects run concurrently especially in the maintenance hence the focus is on all projects. Project management therefore has a huge impact. It’s basically a determining factor in terms of the success of your projects.

“I think for me personally, it would be difficult to run projects without project management knowledge. Because when I started at RA or rather in this division and with development, I didn’t have prior experience in running projects. So, it would have

been difficult but with the project management knowledge, it has been much more easier” (Project control engineer).

“No, I think project management is a very important aspect to our job. Like I said it’s the core, it’s a pillar to what we do and most of the decisions we make or most of the activities that we carry out, we always have to make reference to project management principles and base them on that” (Project control engineer).

The Engineering manager informed that project management is the organisation and management of resources which involves processes and technologies that ensure that a project is carried out within the timeframe, the budget, also not compromising the quality of the service to be delivered. While the participants added that civil engineers’ profession is accompanied by work that applies project management.

Principal Material Engineer explained the important role that project management plays in their work:

“You see, project management, once a project is done in terms of, let’s say you have designed and you are ready for execution of the project. The preparatory works of a certain project is very important. One of the issues that we do not look at, especially in our organization, in my view is the exclusion of the organizational processes which should be guided by the organizational guidelines. So, for a person to develop a guideline that should lead you. A guideline is a set of steps that guides you to deliver a certain product. Now if the organization, let’s say has got a suit of RA manual. This manual from procedures manual, you get the materials, you get the constructions, the drainage, the economics, etc. Now if we deploy the usage of this manual selectively, without following the due process then we might render project management internally, obsolete. It will not function. So, if we want a project management to function, every process we do can deploy project management principles. Because there is time, money or finances involved, there are resources involved. So, the day that I execute, should tally my program for that week because it responds directly to different projects. Now internally, what we do is, even if my duties rely on another division, I tend to not say

convent but I tend to do something that is not part of my scope of work. And I have probably little understanding but I would rather exclude an internal leg that may be competent in that aspect to help my office be more productive. So, when we talk about for example with human capital, if you don't follow procedure, there are policies which guides you. They may guide you through an unwanted event which could be through hearing or through a disciplinary action but when it comes to engineering, regardless of what we do there is no policy apart from our set of guidelines. Which says if this is not delivered in this way, these are the consequences. So, in other words, internal project management cannot be enforced because whatever they do there are no consequences. The consultants are doing the work but nothing says we should not check the consultant. So as part of project management we need to look at who is responsible for the project, what is the time frame, what are the activities faced, what is the time frame, what is the cost implication. So, if we have designed, defined the scope of work, we have attached finance and time resource to it. We should be able to manage it and any leg that renders support towards the delivering of that particular product should be involved. So, in other words the RA should have a project management team that should work in cohesion to deliver the project.”

Need for project management background/ knowledge in road construction projects: A Project control engineer related the need for project management knowledge and experience. It may be useful to bring skills in a job, however, the team can learn from and inspire each other in areas of lack, in order for the projects to be successful.

“Okay, one thing that I try to do is to bring forth what I know, the knowledge that I have or the skills that I have. Bring it forth to the table but still give a little way for the other colleagues to also be themselves while running the projects. I have also tried to sort of inspire others to get project management, you know like to do short courses on project management for them to be able to have some background. But I have not enforced it as much because one thing is in RA it's not a requirement to be project management certified or to have some skills in project management or a qualification in project management. So basically, to do the projects in RA you need to be a civil engineer. So

having project management background is an added advantage. So, it doesn't mean now for the colleagues that are not project management qualified they cannot do the work, they can do the work so what I normally try to do is just to try and inspire for them to also try and incorporate project management, if they like to."

Engineering manager describes his experiences about the quality of work and the cost of supervision.

"I'd say it comes a lot down to the costs of supervision. Because I'd say, if there was more of it, it will be well. But it's not so bad but an improvement will literally be good. And internally, departments like the laboratory which is under technical division and maintenance, they could work together a lot more often. I see contractors acquire services from other laboratories and I mean if we could use own labs it would reduce the cost and we have the same interest."

Additionally, the participant highlights that cooperation or better collaboration of divisions will ensure well managed resources and will in turn save costs because there will be lifting of each other in areas that they lack. Once everyone is well learned in the area of project management, the staff will speak the same language hence even avoid delays in projects. Roads maintenance engineering manager stated that the importance of project management is linked to the civil engineer's job description:

"I just want to go back to the importance of project management. If you just look at our job descriptions, if you look at the area managers now, the primary purpose of their job: responsible for road maintenance and to ensure execution of project management processes. Then you roll it up to engineer. Primary purpose; to conduct and implement design principles and standards of engineering. And you will see in all of our job descriptions project management there, is defined; execute project, administration and site supervision. So, if you see that's one of our primary purposes throughout. Advantages of that, I think it's obvious."

Incorporating project management processes/principles and concepts into daily work: It became apparent during some research interviews that civil engineers must acquaint themselves with the processes of project management and know what principle to apply at every stage of the project on a day-to day basis.

“So basically, project management has different phases which start from planning, initiating, executing, monitoring and controlling, as well as closing off. So depending on which level of the project one is at, I personally do have 1 main project with mini projects falling under that one big project and they are all at different stages. So some of them are still at the planning stage so I get to incorporate the project management processes in planning with those that are at planning stage. Some are at executing phase and so forth. So I get to apply the different project management processes, methods and so forth.” (Project control engineer).

“...we could talk of how it makes our work not say easier but very much progressive and within the standards. It helps us to manage our risks in the project running. Engineers can better identify the risks, assess them and then develop mitigating strategies as to how this risks that we’ve take in projects will not be of major effect negatively on the final product.” (Engineering manager).

In addition, the participants were of the opinion that it is very difficult to work with people who do not have prior project management experience because time is wasted in debates on what should and what should not be. This aspect was also stressed that team members who lack project management skills also tend to be very hard to be encouraged to polish or take up a skill that is needed.

4.5 Application of project management

This theme pertains to the realities of applying project management in the civil engineering projects as described by the participants (see Table 5). Project management can be applied in

construction work which is the industry of practice through the use of all five process groups. One cannot move to the next process without completing the previous.

Table 5 Application of project management

Themes	Sub-themes
Application of project management	Utilisation of the five process groups in project management (initiating, planning, executing, monitoring and controlling, and closing off projects)

Utilisation of the five process groups in project management (initiating, planning, executing, monitoring and controlling, and closing off projects): There are five pointers in project management process groups which are practiced by the civil engineers. These include initiation, planning, execution, monitoring and control, and closing off projects.

“I think I’m practicing them all. ... So basically, maybe I’ll walk you through the processes of maintenance and how you will also be able to identify at which stage we apply those project management aspects. In terms of our division for identifying the need, we have about three means of doing that. We have our road inspectors that go out there and inspect the roads to determine whether there is a need to do something about that, to find a solution to that. We have our Road management system and then we have our stakeholder’s engagement, so that’s the first step in terms of identification and prioritization. And then from there we draw up our annual procurement plan which is based on availability of funds for that financial year. And then after that obviously you put it to tender for procurement upon award, we have to make sure in terms of logistics whether you have your plans on site, whether the person that’s appointed to do the works has the right personnel and all that stuff. And then the execution of the work starts. The actual work studies and then upon that you have to continuously on a continuous basis ensure that the quality of the works is acceptable and that also entail continuous monitoring. And like I said before hand, we do your planning to identify which projects are indeed necessary based on the availability of funds of course. And yah, continuous monitoring of the projects and then on a monthly basis you also have to make sure that the payment certificates are in and you have to ensure that what is being claimed for is actually what is on site. I know our area managers also issue work

problems on a monthly basis. To say this is how much you are allowed to do. Say for blading projects, you can only do so much blading in a day anyways. So yah, that's also part of planning on a monthly basis. Yah, execution of the works, acceptance in terms of quality and yah, all the way to closing off and hand over of the work once the contract comes to an end.” (Engineer).

The engineering manager alludes that they are required as project managers to practice project management in their daily work for efficiency through application of project management principles. However, monitoring and control of works is an ignored phase:

“Alright, I could talk of monitoring and control of works. On the side of RA if we could have more representatives on projects and on site or off site too. Regularly monitor what contractors are doing. This could make up for shortcomings or compromises.”

The engineer added that project monitoring and reporting is an area that he has introduced in his department.

“Mostly it's to do with project monitoring and reporting. We monitor the work that's being done by the contractors, document works and give weekly reports and these reports can be used by the top managers that deal with these projects.”

Participants agreed that it is important that all project management principles are applied in their tasks. Planning was also singled out as the most important aspect of project planning because it helps the civil engineers to know the timeline of the project and know when every aspect of the project is expected to be done. Hence are project management principles are applied correctly, every dollar is spent where it is required and projects are completed on time. Moreso, the application should be in both routine and periodic work, where routine is continuous (always the same thing), while periodic is the specific need that is identified and executed. The civil engineers should find start and end times for the contract period. Once the contract is concluded they then identify, revise it and procure for the same needs. Furthermore,

the difference between project management and contract management should be well distinguished:

“Contract management I would say it’s a portion within project management. And just managing that contract based on its core as you already said budget and the timeline. So even the quality standards of the things are already set within that. So, like a project management you have to set all the delivery from the planning phase to running the whole project, budgeting it, all the programs so within those whole concepts we have contract management inside? Oh okay. So, the reason why I’m asking is so you can see the different phases that we go through with project management like ... said. We need to identify the and that is what we call business plan. That’s way before contract starts. So, we identify, that’s the planning phase. The implementation and the execution. So, contract management is basically the execution, the last phase. So, the importance of project management for us is the beginning of the, identifying the needs and that’s why we have tools to identify needs. Road master plan and also just from our own experience. So, the importance of that is getting the correct needs. If your needs are correct in the first place, the budget will be getting approved ultimately you can prosperity. So, I would say that that’s the aim of all our project management and the delay in that process of not starting at the right time and not, all the way through is tremendous effects on our economy. imagine an important road like 6-2 to Gobabis, imagine we’ve been planning for that road to be rehabilitated, whatever. Say tomorrow something happens at that road and it’s inaccessible. There are about how many trucks, 100 and something trucks running on that road per day, now imagine all of those trucks just stuck? For example, how we did just outside Rehoboth, it’s ah, for goods coming from South Africa, that thing had to collapse. There is no alternative route. We identified and then we cut down, the whole of the South would have been cut down from the central part. So, the contract management for us is basically just the finding stages. Execution portion of it. There should be some negatives, it depends on your execution and also your expertise, your knowledge. I think if you are not adequately qualified then you can probably be doing more damage than. You will go ahead and set unrealistic timelines. You will not be planning within your expertise and what’s realistic. So, you could set unrealistic goals.” (Senior Civil Engineer).

The participant gave an example to make the researcher understand his opinion better:

“I think maybe a recent good example would be with the contracts. Maybe some of them were slightly underestimated and that puts you in a bad situation where, not in a bad situation but you don’t need to plan so much around it. We could have maybe done due diligence on those specific things or also materials. We could have done more diligence on the materials. But then there is also a lot of other external factors that hinder that. I mean you can do as much planning but if your procurement process is delayed, those quantities can also now change. If you have X amount of fill to do or formation, maybe two years down the line what you’ve planned for has changed now. The way we understand project management is that basically how does it affect your work and improve your work once you know. What is that slogan, ‘planning to fail is failing to plan or however it goes’. Project management is a tool so if there’s any negatives it’s just due to poor execution or inadequate knowledge.”

The participants’ views were that the execution style of the project or the scope exchange between projects is costly. This affects the roles which were not planned for because changing the scope means even the project management principle will change, thus affecting its application in various projects at the same time.

4.6 Impact of project management

The theme concerns efforts of project management as well as its perceived implications in projects as described by the participants (see Table 6).

Table 6 Impact of project management

Themes	Sub-themes
Impact of project management	Constraints of project management (time, quality, and scope)
	Miscommunication and lack of understanding in other divisions
	Stakeholder engagement and contractor empowerment in project management

Constraints of project management (time, quality, and scope): The participants established that there are three constraints of project management namely time, quality, and scope. These constraints should be considered in all the construction projects by the organization to ensure that they are done in the specified time and budget. It was alluded that the knowledge of the three constraints aids in the successes of the projects. Project control engineer stated:

“Yes, obviously. Because it’s project management. You have to look at your time. I think when we are doing our procurement plan for instance, we have a scope, scope of works, we come up with a gphant chart to say this project is likely to run from this month to that month and then in there you have your aspects to say this is what will be covered during this stage. So your scope is catered for in there. So the knowledge that you have with that goes a long way because then it will also help you make informed decision as to how much time to allocate, how much money and in terms of what your scope is like. So those are quite relevant in my line of work. You take them into account when you make certain decisions as to what is allowed. Even in terms of claims, when a contractor puts in a claim to say “I’ve done so much additional work”, that again you refer back to those aspects of project management.”

Project control engineer added that the organization is likely to incur costs or additional costs due to the lack of urgency from counterpart divisions.

“Yah, I know, like for example you mentioned lastly on if people have to now wait for that, the equipment which are on site and they are already paid hourly so not only are we delaying time, we are incurring more costs. That’s true and I think that experience with her especially with the new procurement act. I think back in the days it wasn’t that extreme. But now with the new procurement act which is clearly outlining that says that you need to clearly request for quotations, you need to do this and that, by the time you are busy putting through submissions, you are on standstill and you are incurring costs. So yah, we need to do better.”

Civil engineering manager ascribed to positive impact of project management. Project management is helpful and civil engineers are encouraged to lean to it being almost entirely

positive as it allows for costs to be controlled within the project. This is through engineers who come up with cost estimates of the work to be done and have budgets pre-determined, which then allow costs to be within the cost ceiling during monitoring. The participant further stressed:

“I can go on to talk about it helping us to make sure that we complete our projects within time. This is by us setting up schedules and milestones. We make programs of works on a monthly basis for contractors that they should do and we monitor this progress to make sure at the end of the month they deliver these quantities of works and therefor if we keep within that program every month at the end of the year, we should have covered all the work within the budget. We can also talk about how we can efficiently allocate our resources within the organization and we are talking of for example how we can allocate graders to areas depending on the need of the roads. Certain roads don't require, speaking of gravel roads, they don't require to be maintained as often as others depending on traffic and all that. And how we decide how often road will be maintained also.”

Project management ensures that resources are allocated and time is well managed. Consequently, tasks are completed in time and the frequency of road maintenance is determined which speaks to quality.

“In doing so, when we allocate the resources and manage time, in the end efficiency of resources is obtained that way our quality of works is always the number one priority. The cost also plays an important role in making sure that because if we deplete funds and then we have to divert it to cheaper ways of, let's say if a main road has to be maintained let's say twice a month and because of a lack of graders we now have to, ah for it to be maintained ones. That plays around with our quality and ensuring that this does not come about” (Engineering manager).

Senior civil engineer stated that communication is also very important in projects. She gave an example where the samples collected did not meet the required criteria due to lack of communication.

“There was an instance on one of our projects whereby the laboratory gave results for borrow pits, some of the borrow pits had no material at all and some of them the material was not enough, so that resulted in delays on the other end. So, I think if they maybe communicated better or earlier, it would have saved, it would have avoided some of those issues.”

Principal Material Engineer explained the process of project management as being broad and the need to be cognisance of time, quality and scope.

“You see, with project management in itself is also very broad and you get, for example what we face is you get a consultant, supervising a project and you have the contractor doing the project. The consultant will look at the contractor’s program but the consultant also will have their program. Now the issue is in marrying or tying the two programs, there are certain challenges that the contractor may experience on site. But now when it comes to the project management as work aspect, for example there is a certain activity that is being delayed and there are different approaches to it. You either increase your resource, where it can be financial or human capital or machines, so that you can tackle a certain activity and finish it and go to the next. So, when you do the resource leveling and you bring people onto a certain activity. Each activity is costed. So due to financial implications on that particular activity, you will finish it without hindering your schedule but it will be extra or unaccounted costs. So, this at the end of the day, eventually will affect your other activities. So, when it comes now to say on the experience with the project management, on the sort of like a negative side is the project management aspect requires you to do resource leveling but it may be at the cost of the contractor and in which case the contractor might compromise the quality of work going into the... so you can get extension of time but you don’t get extension of money. For you to justify money is always very difficult. But on the positive side, it’s very good to have project management in a sense that to avoid any lacking on any activity, you have to be deployed the right resources for the right job at the right time. This is where project management becomes very important and critical into optimizing resource usage on a project.”

Miscommunication and lack of understanding in other divisions: The civil engineers echoed that the principles of project management should be known by all the divisions within and outside the Roads Authority to ensure that communication is clear and guided by the project needs. The procurement department was mentioned to have been behind many delays in the construction industry mainly related to miscommunication.

“To a certain extent yes, they do know a little bit about project management but then not to the extent that we as engineers are willed as on. And I would say there are sort of delaying the whole process because of that miscommunication or misunderstanding of the concept of managing a project and contracts management. Because you find now that there is no sense of urgency. Project management means making decisions on your toes and unfortunately certain divisions that are also involved in the procurement like procurement for instance. They rely heavily on processes that are not easily, they are not flexible processes. So, most of the time as a project manager you need to make ad hoc decisions for instance. Or take ad hoc steps to sort of resolve an issue but due to the non-urgency or the lack of understanding from our counter parts, that is usually misunderstood. Then you are likely to fall behind on your project because of those results. You’ll fall back on your project. And then even in terms of funding, when you are a project manager especially in engineering. On a project you are faced with a lot of unforeseen sorts of circumstances or you find that now you have to blast initially you didn’t plan for that and for you to put in a request now through procurement for the GRN to get somebody that can handle explosives for instance. It will take long, they have a process that says that no we need to call for quotations although they make provision for emergency, it’s still a bit of a hindrance.” (Project control engineer).

Miscommunication impacts the projects negatively, for it delays the whole project.

“I mainly like to focus on communication, I think it helps improve communication between stakeholders. Like how we hold monthly meetings with contractors and then

we just communicate on maybe issues and that helps our engineers to solve the issues without costing any delay on the projects.” (Senior civil engineer).

Stakeholder engagement and contractor empowerment in project management:

Irrespective of possessing the necessary qualifications and extensive experience in their respective specialties, participants opined that the stakeholders in the construction fraternity should speak the same language, which is project management. This includes the government, the contractors, the project managers and personnel from other divisions that are linked to civil engineering work directly or indirectly. The quality of work depends on the principles or concepts of project management.

“So, the basic definition of project management is like what you said, if you identify your needs and you then plan and execute your needs within a certain time and cost and you manage the execution of what you have identified within those time and cost perimeter to meet stakeholder expectations. So that’s basically it. I think if you also look at the project management of RA project, depending who you are there is also different start and end points of your role in the project. So as a consultant, their role of project management has a much later start and end point than we have. If on our side as the client you would start by identifying the need. So, we have a much earlier role in the project than let’s say consultant or contractor even though they still need to apply project management principles, so for us we’ll start with identifying, planning and procuring. Depending on the size of the project that goes over to the project manager and the contractor as well. So, they also apply project management principles to the project but they start at a specific stage. And then depending on our level of responsibility, we either do less at that stage or more depending if there is a consultant or not. I think the key things is to whatever you have identified, that you execute and that those things are managed within the expectations time and cost and also quality.” (Senior Civil Engineer).

4.7 Challenges in project management

At the time of data collection, the participants expressed the shortcoming in the projects attributed to by the project management. Although the civil engineers were vocal about the need for everyone on the construction project to have some sort of knowledge in the subject matter, challenges exist that hinder its realisation as shown in Table 7.

Table 7 Challenges in project management

Themes	Sub-themes
Challenges in Project Management	Resistance to change from team members
	Dependence on other functional legs for project delivery
	Delay in project timelines

Resistance to change from team members: The participants highlighted that the main challenge that hinders progress in project management as far as construction work supervised by the civil engineers are concerned is the resistance to individual change with regard to upskilling.

“Okay, basically there are challenges, you know when you do a project you don’t do it alone, you have a team of other experts on the project. And some team members, if I may say, they have a way of doing things like or they defend on “this is the way that we have been doing it so we’ll keep doing it this way” when there are improved ways on how to ensure that you achieve the goal of the project, had they known that, it would have been better to achieve those goals. But sometimes the absence of project management skills makes it difficult to work on projects with some of the members that are not well acquainted with that.” (Project control engineer).

The Project control engineer registered that it is much easier to do projects or tasks with personnel who have some basic principles of project management

“Yah, it is much easier but also, I’m not saying everyone on the project needs to have project management background. But if you were also working with someone who

doesn't have that background but is willing to learn, it might be, it makes it easier as well."

Principle material engineer concurred that the lack of project management skills usually costs time and money.

"You see unlike the usual project, in project management that you have different milestone, with us it's when you test a material and the need arises sometimes you need to procure something, and the procurement process when you follow it, you get delayed. Typically, on a project, let's say on development, people are pushing between 600 metres to 800 metres a day of processing. So, if you get a duplicate sample of let's say for a survey and they are pushing 800 metres a day just to do the CBR you need a minimum of 6 to 7 days. Now within 7 days these guys might have done already more than 4km. So, to bring them back it costs money. So, when have to procure for something you might be delayed for another 2 to 3 weeks. So, after 1 month even if you find out that there is an issue at a certain point at a certain position but the same method has been carried out. You could have resolved it at 800 metre but now people have to re-look at the whole let's say 10km just because of procurement. So, these are some of the challenges that we face while running our projects."

Dependence on other functional legs for project delivery: The experiences of the participants in the study was that project completion does not solely only depend on their departments, but many divisions are involved. This is a challenge that needs to be addressed for projects to run smoothly.

"Okay isn't it, or work through so many divisions, like network planning with the others and stuff. So, procurement, those not an engineering division, it also has a bigger impact on the time of delivery. So, we talk of time, we talk of scope, we talk of quality, engineering provides the quality part through our specifications. So, in terms of time, you know there are implications on the time so people can get, with all that. So I haven't worked on any project so let me mention a project I've seen and a number of, I was out for that lot something is being evaluated, right? So, the fact that it was advertised back

then it means that there was a need for it, right, isn't it? So that thing hasn't been awarded and there is a lot of back logs and all those staff."

Project control engineer added:

"... Why I say that is because, of course there has been a delay in terms of time and the procurement processes but in terms of at the point which this contract has been appointed for, we are not yet at that stage where we need him onsite as we speak due to some delays as well by the main contractor. So, this specific lot, his work depends on the progress of the main contractor. So, the main contractor didn't reach that stage yet where the SME contractor needs to be there so based on that I'm saying that we are still safe. But overall, there is a delay in terms of time but also what we try to do it sensitize the procurement as well to say these are the implications that we can have if the project is delayed this way or any other."

The Project control engineer further added that risk management is lacking in their project management.

"We know where risk management features unless it comes in with acid management which is another topic on its own but when we do project management, there is no risk assessment like we said if this gate is closed, if that road is closed. You know basically it's just, project management plan. It's just one route. If the CEO is not in, nothing gets done, not allowed to delegate power, if X is not in to sign or approve something then the whole process stops. Like this now when we had to change the scope for this GRE project. If we want to get approval as soon as possible, we had a deadline to get it to the central procurement board, they then review the submission and then they load it onto their system for the next week for the board to give approval. So, we had to compile the submission, get the financial certificate, all the annexures, the supporting documents and it had to go to their division of managers office for a signature. Now the division manager was on other duties outside his office, he could not sign it. So, he could not sign it, the financial certificate could not be processed, so we were waiting on him to sign in order to get it through that gate to get it to the next person. We finalize that

process; it needs to go to the CEO. Now the CEO, he's visiting some sites or he also has other duties outside of the office, now he's not in so he could not sign and now yet again we got delayed by another day. So ultimately, we missed the deadline at central procurement board, which means the whole thing shifted a week ahead. And the contractor is already on site, he is done with his graveling works, he's on the portion that we are requesting this scope to be changed and we are waiting for an answer."

The participants agreed that the contractor cannot be stopped once the work has commenced. The fear is that the contractor claims standing costs against the Roads Authority or civil engineers. To avoid such occurrences, the contractor is informed to continue with work for instance by telling them to make the road a little bigger and hold off some activities like the slushing and the brooming of the road. So, the road is constructed as a gravel base, but as soon the engineers get approval the contractor goes back to the first section and start doing the slushing and the brooming. Roads maintenance civil engineer informs that the civil engineers are limited in terms of the extent to which they can complete the projects:

"Yah. Already at the initial planning phase, we are short on what we actually would like to do. So that's not quite specific but just project management I think at the planning phase there's a lot more that we would like to do but we are unfortunately a bit handicapped there."

Delay in project timelines: For civil engineers, work passes through so many divisions. The network planning that occurs with other divisions such as procurement which is not an engineering division has a bigger impact on the project time delivery. As such, time, scope, and quality are compromised. Engineering provides the quality part through specifications.

"For this specific one that you are referring to, somehow, we are on the safe side. Why I say that is because, of course there has been a delay in terms of time and the procurement processes but in terms of at the point which this contract has been appointed for, we are not yet at that stage where we need him onsite as we speak due to some delays as well by the main contractor. So, this specific lot, his work depends on

the progress of the main contractor. So, the main contractor didn't reach that stage yet where the SME contractor needs to be there so based on that I'm saying that we are still safe. But overall, there is a delay in terms of time but also what we try to do it sensitize the procurement as well to say these are the implications that we can have if the project is delayed this way or any other.” (Project control engineer).

Resource constraint was highlighted by Civil engineering manager as another delay in the project timeline coupled with the time and skills required from the contractors' side.

“The number one I'd talk about the resource constraint, and this is to talk of the skilled labour. The fact that contractors, do their job on site and our job is to supervise. We have a certain degree of control as to the labour that the contractors the laborer that they employ but not necessarily as to who and what not. So, whether the laborers are skilled or not, it only come down to the performance and we find that performance of work is lacking and due to labour or equipment that the contractors are using, it quite plays around with our resources because we are paying for this and if we are to make up for that it's also on our time and for example if we have to finish a program and because the laborers haven't done a good job and we have to redo it. We are not going to finish it.”

The Senior civil engineer stressed that if more time is spent repeating a number of things on the project, then more time is spent on the overall project as opposed to the specific money for a specific activity once. This causes a delay when it was supposed to be completed.

“I'd say maybe time delays on projects due to resource constraints. Like on one of our projects there was lack of water. This can be attributed to poor planning and communication as well.” (Senior civil engineer).

The shortage of staff was also mentioned as a challenge since there were at least two or three road inspectors missing. The team is understaffed so in terms of supervision the project

managers cannot be where they would want to as often as they like. There is a lack of interrelation of the divisions in working towards completion of the projects. It was found that for the project to continue the engineers had to consult procurement as well for funding towards a set scope.

“For example, if procurement is delaying us on some things there is no one else who would be able to say why are you doing that, they are doing that on their own time. This division have said this is how long it’s supposed to take, how it’s supposed to cost so the more you delay, the more you get to affect the process. No actually, it would be a great initiative to have a process from the user division or the initiator. Usually with the new procurement policy of procurement act, you are defined or you are given different periods to deliver certain deliverables. For example, after opening of a tender, you have to evaluate and you are given a timeframe. When you are done, you go to a next stage let’s say you start with your technical and then you come to your financial. When you are done, you go to the negotiation and award stage. So, all this has timeframes but where are we actually lacking? When one gives in their report to procurement, they may be pre-occupied by very petty activities. Forgetting that the major activities have a huge implication on the RA overall budget. So, for example if a project is to be implemented and let’s say it’s 600 million and 120 million needs to be rolled out for phase 1 or a particular financial year, so any delay in that like now, the operational budget is not yet loaded. So, the implication by finance and procurement, to them they are following the procedure or something is delaying them and they have got what what not. For us now, it’s an issue. Number 1, you should delay a project and to award it after let’s say 3-4 months, the value of the project has already started depreciating, the money itself. Today’s dollar, if I give you 10 dollars today and if I give you 10-dollar next week, the value of today’s 10 dollar against next week’s 10 dollars. Next week’s 10 dollar is probably worth 9 dollar. So, the 1 dollar has already fallen off but we don’t think in that term. The organization skill does not think in that aspect so having a business or having a project management model internally, that can help to strengthen the interrelationship activities which leads to the final execution and delivery of a certain product or project will definitely be welcome and should be encouraged from my point of view.” (Principal Material Engineer).

Principle material engineer further added in details about the activities, specifically the milestones attached to delivery time.

“Yes, yes, because like in the first place when you were sitting and getting to plan the project, getting to bring out it’s milestones, all that is included so you already have a market related or something that there is something, you already have to what it takes, how much time, what equipment and how long it will take. So with that whole thing then you will be able to come up with an estimate. So like the moment you guess to that while it’s at 50%. So it’s either like for you who is going to always say I’m increasing it to that, you want to agree that I did not plan better. I left something out and then someone else is letting you do that or like you really plan better but something is just not right. Those things are already met in the beginning. So that’s why we have a principle, come up with a specification, come up with a certain items, put the price. We really .. so that whole thing of .. I think then if I also have to come back to the model, this is something else which will be able to tell us like okay, if you had planned for this and if you know how much it will cost and if so how come you are now asking for more money then that? So like .. when we have to talk about procurement so let’s say for example, I’ll give you an example of the place we go to now. So that place we are going to do the first 5km, that ... it was not part of the actual contract and since the material thing is an issue, so we figured that we go ahead and slash and finish it now we are going to save our self from coming back and doing the road because we don’t have material, then that whole process now as the contract is standing there we are paying them for standing there. Like we are paying money for something which is not happening because the procurement does not allow us to continue so if we have a model like this one then we have someone else to understand then to be able to intervene and say this is also for this and that and then we also prevent that from taking that long. That is my understanding to it.”

Several participants indicated that there is no quality assessment in the projects hence not everyone is bothered to deliver quality work.

“Yes, but they are going there for a reason. It could be quality, it could be convenience, it could be price, it could be whole lot of other things but all this alternative is to get the

same product and they have done their own evaluation. The service providers or the retailers, they know about this competition, in fact they don't tender, they don't go out there to look for people. In fact, all they run adverts. In the shop or outside or wherever. That's how they attract their people. Now with us, how do we decide that we are going to put a single seal, that we are going to put a cape seal 13 or 19mm, we are going to put an ... we are going to put advices us? Nothing. So far, we have not done, there is no proper assessment criteria for the performance of a cape seal. We have not done anything. Ever since of Namibia has been using the inception if, we have not done any in service performance of a Cape seal or any other seal. Why can't we do it? You put a Cape seal, you put a Jog seal, you put a double seal, you put a whatever you call it. We can monitor these sections, you can do texture .., you do your bolt penetration and your .. tests. And then you can even take out some of the sections and you patch it back, you go and recover the binder in the lab. And you determine your softening point, your penetration, you do your ductility test, viscosity, all this sedimentation. So, there is a whole lot of activities that we can do including the aging test to actually determine the performance of our servicing seals over a period of time, we do not do.” (Principal Material Engineer)

The Principal Material Engineer added that a model will advise the Roads authority to be strict because a performance of Cape seal was already done. The civil engineers will know when to put a rejuvenator, and when is it a waste of money and time to put it based off the assessment that was already done. This meant that putting a rejuvenator after eight years or before five years is a waste of money, but it should be informed by a set of guidelines that emanate from or embedded into the model to advise civil engineers on what to do.

“It is important for us to be able to utilize this model on our own to be able to understand them instead of only waiting for the consultant because they are also making their decision on cost whichever because they have their own .. So, like if we have this information on how we design and how we capture that then we will be able to make a decision, which is good to our organization. Because our aim is to make sure that maintain and have good quality.”

4.8 Organizational Project Management Model

The theme is about civil engineering organisations to have a project management model to minimise the delays in implementing or completing the projects. This theme had five subthemes that emanated from it as depicted in Table 8.

Table 8 Organizational Project Management Model

Themes	Sub-themes
Organizational Project Management Model	Stand-alone project management leg in the organization
	Sensitise the organization about the importance of time and project management
	Comparison with other organizations that have project management offices (PMOs)
	Unite divisions, stakeholders and contractors to align with project management principles
	Need for contingency planning in uncertain projects

Stand-alone project management leg in the organization: The civil engineers highlighted that there is no organizational project management model at the work of place, namely Roads Authority. However, they acknowledged the presence of certain goals and ways of operation in the different divisions. The model should be used to make an efficient use of time and money to produce valuable services and constructions. As such, contractors are not delayed once work starts and quality equipment is used instead of utilization of whatever is available regardless of the quality. The participants shared that a stand-alone model is needed for successful projects.

“Currently we only have the RA’s organogram only has functional legs, if I may say. So should I be being involved, I would rather propose that we include a project management leg that does not depend on functional, because now even the projects management aspect in RA depends on the support of the functional legs. So, what I would recommend is to have a stand-alone leg for project management. That way it would make the delivery of projects much efficient because currently just like you said, a mere comment from procurement can cause a whole delay in everything. Because we

are now dependent on procurement, we are dependent on what finance says, we are dependent on what whoever says, we are not stand-alone. It's almost like without them projects cannot be done.” (Principal Material Engineer)

The Civil Engineer added that organizational model to guide project management in civil engineering projects is needed and very important.

“I think that’s a very nice question by the way. I think from my experience, now that I know, I know the loopholes and I think I would first and foremost try to sort of convene together this divisions under one umbrella. Obviously under the PMP umbrella, because at the end of the day we are at area project managers, right. That’s our core function as an engineering division, we manage projects. So it will be great if we can all come together, be versed on those project management concepts so that we understand initial sense when a division runs through, or a request then it’s handled with the same urgency or professionalism that is expected. Based on project management principles rather than the normal procurement principles that are sort of out of touch with our core function. And bring together people that’s very important. Just so that we are on the same page and that doesn’t only entail our in-house divisions, that we would also now take into account our stakeholders, the funding agency which is the RFE and maybe our contractors as well. I know we have an ITT unit for instance, maybe we can also, I know in the past they have given short courses to our contractors to sort of just to empower them. So that they also understand the in-house processes. Because most of the claims that we get are based on certain things that they don’t understand or certain delays that they don’t understand or delay in payments, but if we can also bring them together and say look, we as the RA will give you an introduction to PMP or project management for instance, just to get you by, that would really go a long way, it would actually smoothen the processes, in-house as well. So, it’s very important.”

Principal Material Engineer further added:

“So, let’s say for example, you have a project, okay let’s say a certain division. You have a division of a manager and you have senior engineer so we have to oversee certain

activities of the project control engineers, the organization is somehow still trying that when the PC is bring certain activity for clarity or for discussion at a senior engineer level, they seem not to get that assistance. Now if we can have a defined process as to what are the activities that a certain leg should possess effect or implement on a project. If we can define different levels or activities on this model, which gives the user division in terms of the PCE comfort to understand that when I reach this stage, this is what I expect from my senior engineer to assist me with. So, we have a lot of people that are experienced and those that are not experienced with different qualifications. So now if we can have a model in terms of experience that can help guide the younger ones or help guide those who may have experience but still don't have the academic understanding of certain processes. How do we help them or how do we guide them using a management tool. So, a management tool does not necessarily look at the project but in today's corporate world, we look at our corporate governors, we look at behaviour, we look at characteristics, we look at the personality, we look at emotional intelligence. You will find that there is a new set of criteria that they are looking for in project management because of a lot of people who are involved as we have done there during the other training, there is now the leadership component that is coming in. How would you lead and how would you manage the people and there is now a differentiation that a leader has different qualities, a manager has different quality. So, this model for me, it should incorporate training, it should incorporate monitoring and evaluation of personnel and when we do the training, we look at the practical aspect in terms of the technical, financial and also people's management. So, it should form part of that project management model."

The Principal Material Engineer explains that the model will help with regard to cost and time management.

"I think the model will assist us in terms of trying to manage our resources better. When you have something in place that you engage yourself against internally, then it becomes easier for you to for example terminate, suspend or you have to re-evaluate and suspend or evaluate and suspend what do I mean by that? When we have a project, you can go over 15%, it used to be 20%. Now when we evaluating, you say there's an engineer's

estimate and this estimate, we as the authority we say there are thresholds, below and above, let's say 15%. When we award and the person is within this, what it actually means is that if we have to go out of the accepted costs, we can allow for a 15% above. If we go 20% above, exceeding by 5% of the threshold in terms of engineering, you terminate, it's not cost effective. But in the, what we have observed in the authority is that when it begins to go through or above that, we then begin to write submission to seek for board approval. So, the board can approve even up to 50% and we have seen it and it has happened before termination. So, in terms of engineering, this is no more engineering, that's a waste of money."

Sensitise the organization about the importance of time and project management:

The civil engineers opined that the establishment of a stand-alone project management model should be accompanied by a thorough monitoring aspect whereby the process is explained to all custodians and beneficiaries.

"Yes, because now it's almost like we tell them what we want or what we need but then they decide how they are going to deliver to us. We are not, I'm speaking now in terms of projects, we are not but if project management or the management of projects was stand-alone then you just tell them what you need, what you want then they deliver based on your needs. You give them the timeline to say look by end of this month I need this, then they deliver. But now it's the other way around, you need to wait for the procurement dates to be set before you can send out your report for example. You need to wait for the budget to be loaded I don't know when, before the payments can be processed. So now we sort of depend on them, so what I'm trying to say is, projects need to be the lead then the other functions support that. But now it's the other way around."
(Civil Engineer).

The civil engineers informed that some other organizations have project management models which runs most of their project management related activities in their organizations. From procurement, project execution and supervision and other items considers the importance of

time and project management. Accordingly, these allows collaboration within and between divisions and allows people who are responsible to make sure that projects are run accordingly and on time without compromising the quality. Hence the need for an implementation of an organizational project management model in RA, with sensitization about the importance of time and project management.

“Right. I will suggest the establishment of knowledge management practices and this is by sharing project ... in the past, what was done, the lessons that were learned in the project and documenting and unveiling this to current project managers to see how we can mitigate or avoid this challenges that were faced. And also, to improve the staff, continuous improvement is important. we can only improve from the lessons that we have learned.” (Civil engineering manager).

Senior civil engineer added:

“I feel like the level of indication which we get as civil engineers from school; it does introduce us to project management principle as we do contract management in other courses. But I think it’s sufficient for us to be able to better manage our projects. I don’t think it’s sufficient because they need to train the engineers according to RA goals and principles or standards. You see, when we want to initiate or develop the project management model, number 1, we need to review the current processes and procedures in the RA. I can tell you with strong confidence that 90% of RA engineer have not read their manual. This RA manual.”

Principle material engineer informs that as much as organizational project management model is vital, should be accompanied by a guideline to serve as a compass through projects.

“So but if we look in there in RA guide they will guide us on ... major consultant, what are the ... criteria that we expect from the consultant or the external engineer. What is expected internally. How do we make sure that there is quality control, when is quality control required, what is the implications on a project if quality control procedure is not looked at? I will give you one scenario, practical one, we are about to rehabilitate Karibib – Usakos. They will tell you it was planned before when the economy was better.

And they wanted to do the whole road, Okahandja – Karibib, Karibib – Usakos, Usakos – Arandis, Arandis all the way to Swakop and also then the Otjiwarongo all the way to Karibib. So, because that was already designed, they were at a certain point I think, pending evaluations only. Now that money is there, they are now going to rehabilitate that stretch. Now in project management, if we had a model, regardless of how urgent or who is funding the project, if we had a model then this model should advise us, where should we place the money. Karibib – Usakos being a narrow road does not guarantee us to rehabilitate it when structural. Yes, it's still sound, the structural aspect is still sound. If there are any potholes ever repaired on that stretch, I can tell you they are not even more than 5 because I have not seen one. So structural is ... there is no ... Now, if we had a model, it would tell us that between Usakos and Arandis, we could do what we call a breather of 30km. A breather of 30km is a lot in terms of safety. To do 2 plus 1, is a huge breather but now a stretch of 30 kilo that people can manage, we are trying to make it a priority versus a stretch of more than 80 km. Now when people are constricted and constrained on a longer section, fatigue comes in. With fatigue, you have inevitable probability of people involving in an accident but you can manage to concentrate for 30 kilos. So, when you have Okahandja – Karibib with all these 2 plus 1 giving a relief and then you have Arandis – Usakos let's say giving a relief, when you reach on that stretch, you are fresh and you can maneuver through and you are out. Towards Okahandja another relief, imagine you are out of that section towards Arandis but in a relief. But we don't have a model that can guide us, how do we prioritize?"

The civil engineer added that focusing on prioritizing something which does not need attention since it was planned years back and it's no longer practical, the agenda needs to be pushed with the help of the model. The model will inform on the current priorities on a needs basis.

"Even if you take 12 months to design, it is better to go for a priority then something that is not a priority. So, the road was built in 1964, finished off with ceiling in 1974, more than 40 years, why is it still performing? The leg was never invited to go and do the investigation. We are about to go and rehabilitate that road. We do not understand why did it perform for 40 years but with a model, the model will say wow, before you embark here internally, the RA laboratory services has to go and do centerline

investigation. When you do the centerline investigation, then we will say wow you don't need to stabilize the sub-base because the sub-base which is now the existing base cause has lived for 40 years no deterioration in material and it's still intact. So, we might end up just removing the thing which is working strong enough, we go put something else which will deteriorate and give us potholes in the next year. It is what is happening, go and look at Omaruru - Karibib.” (Principal Material Engineer).

Comparison with other organizations that have project management offices (PMOs): The civil engineers opined that project managers should have an understanding of project management not only through training, but by learning from other organisations that have project management offices.

“Yes, in other organizations have what you call project management offices, PMO's if I'm not mistaken. It's a stand-alone office, it's almost like how we have our internal audit. They are stand-alone, they can do their thing, they can show up in your office and start doing their investigations without questions, without appointment, without anything. So that's how PMO's in other organizations they operate. They get the things done to make sure the stuff are, the projects are being done within the provided time period, within the budget and so forth because they are stand-alone.” (Project control engineer).

The researcher asked participants to share their experiences in terms of project management solutions that they have personally provided in their work place. The participants shared that they have learnt and adopted three to five processes which defines speed and deadlines. Since the inception of learning from other organisations, there are now clearly defined roles for everyone involved in the project management process.

“Yah like the payment process. Each one's roles are clearly defined and the processes are also clearly defined. I think we also have policies in place which will guide us in some of those things. Obviously, our project specs and our project also guide us clearly. So, if it comes to something specific that we have time, is over the years as we have gained some more experience, we have probably changed some clauses in the contract.

So, we take note of short comings in the contract that can be approved upon, that's definitely a place where we have. We learn on every project, we learn something new, so come the next contract then we can take what we have learned and incorporate that in that document. Our things that we have implemented in our work place or our office specifically is templates. So those are things that simplify some of the activities.”(Principal Material Engineer).

On the other hand, participants opined that other organisations have made their work easier by using technology. As the Project control engineer stresses:

“... other thing that I think .. too that will help us improve on our project management is technology. If we can utilize technology because currently, we have a lot of work. If you just think about it like inspections, I'm probably sitting with 50 photos I took today, so now I have to put it on paper and blah blah blah. So if an app was there it was immediately uploaded and it was immediately available to all. Technology, we need to make use of technology. Even if you look at the other important part which is the costs of tender document, of items in a bill is we reply too much on historical. So, for me if you look at the profit margins of these things it's ridiculous. So that's one thing where we need tools, there is tools but again just to procure those tools is ridiculous if you look at the apps that we have installed in our phones, on our laptops, one month, two months done, nothing. Yes, if we can better control qualities and quantities then .. and also, the costs thereof, that will have a major impact on the organization. The one thing that I was really impressed with but perhaps it still has some challenges is the conference I was attending in Dubai. There was 2 companies actually with lie-down technology, it can be mounted on any vehicle and you've got an as-built model of your infrastructure. So, let's say Windhoek-Okahandja, theirs is an as-built model for that road. And then with this lie-down system that's mounted to one of the roads inspectors' vehicles, he just drives the rout up and down and that lie-down system basically scans the road and compares it to your as-built model. So it will tell you here is a .. missing, it's at this .. , it's this length. Her is a road sign missing, it's this road sign, it's this code. And it will tell you here is a pothole, it's approximately that size, it's this big. And once the inspector has travelled the route and back you upload that to your system and

it basically compiles you a small POQ of what's outstanding. But the problem with the system was that it couldn't pick up small cracks. So, for some cracks you won't be able to."

In addition to technology, the Principal Material Engineer expressed his concern that the civil engineers are not managing one project at a time, which poses a challenge. Managing many contractors affects the effectiveness of supervision especially with regard to time.

"If you have seven different blading contractors that you have to manage at once. Imagine how many things you can miss if you look at our road network coverage that we do. On a weekly basis I drive a new road every day and for me to come back to that road again, I don't know how many years it's going to take. So again, we miss quite a few things during our planning. We focus mostly on the bigger things and forget the smaller issues."

Unite divisions, stakeholders and contractors to align with PM principles: Several participants, that is, Project control engineer, Project management planner, Roads maintenance civil engineer, and Principle material engineer seemed to relate to divisions, stakeholders and contractors to align with the project management principle. Therefore, running projects require knowledge of project management and practice provided that all divisions involved work together:

"I think that's a very nice question by the way. I think from my experience, now that I know, I know the loopholes and I think I would first and foremost try to sort of convene together this divisions under one umbrella. Obviously under the PMP umbrella, because at the end of the day we are at area project managers, right. That's our core function as an engineering division, we manage projects. So, it will be great if we can all come together, be versed on those project management concepts so that we understand initial sense when a division runs through, or a request then it's handled with the same urgency or professionalism that is expected. Based on project management principles rather than the normal procurement principles that are sort of out of touch with our core

function. And bring together people that's very important. Just so that we are on the same page and that doesn't only entail our in-house divisions, that we would also now take into account our stakeholders, the funding agency which is the RFE and maybe our contractors as well. I know we have an ITT unit for instance, maybe we can also, I know in the past they have given short courses to our contractors to sort of just to empower them. So that they also understand the in-house processes. Because most of the claims that we get are based on certain things that they don't understand or certain delays that they don't understand or delay in payments, but if we can also bring them together and say look, we as the RA will give you an introduction to PMP or project management for instance, just to get you by, that would really go a long way, it would actually smoothen the processes, in-house as well. So, it's very important.” (Project management planner).

“If that process can be effective then we will much improve our ... That and also I would say the .. being disconnected. Something that everyone is not aware of. For instance construction of .. where we start doing things like light rehabs and .. those sorts of things. ... where the .. would have been more active. One thing that's also on the contract managements side is the powers in the contract is delegated to various authorities. The powers does not belong solely to the budget manager if .. the variation. Now imagine you have to go through various channels to get it approved. Once if that was with you then obviously that comes down to if the funds are available why can't they ... it. So now if you look at the powers in the contract management is split over various departments so now if I have to make sure variation, I have to go back to procurement ultimately see who wants to sign if I want to proof extention of time, it also has to go through procurement even if I ... There's a lot of gates to take precaution but in the same breath we are also paralyzing our ability to... It's a lengthy process just to accomplish something else which can be done in one division. Yes, if you look at the payment process which is also an important part is, once you get approved for payment, we have no control over what happens after that. It's sent out again to various departments and remember if contractors are not paid on time then to claim, to suspension. It affects us also. Yes, so it's like that.”(Roads maintenance civil engineer).

The Roads maintenance civil engineer further explained:

“There are a lot of gates that we have to go through. Ultimately, I understand there has to be control. I noticed that with VKE which was bought by SMEC and then SMEC was bought by some other company and we were changing to ISOS standards and in the process of changing to ISOS standards, there’s a lot of new red tape involved with. You can’t just make a decision, there’s a lot of approval things. There’s a benefit and a disadvantage to it. The one benefit is obviously accountability and controlling things. But with that it also kind of paralyses you from making decisions because you rely on all these other extra gates that you need to go through to. Out of ... when you just look at our quality control or substance control, we have to rely .. on another department which is also all over the country so there’s too many gates and for me to get that approved I have to .. to approve it which is probably early impossible within a specified timeframe. So maybe from a risk point of view with the organization it’s beneficial for them to have those extra gates but then that’s only beneficial to avoid people from making mistakes and if you have people that are incompetent. But if you’ve got staff that know what they are doing and they are innovative then it becomes a problem.”

Need for contingency planning in uncertain projects: The Senior Civil Engineer narrated the need for contingency plans in projects which are uncertain.

“... if you are just looking at the payment process, look at this amount of paper just on my table, just for finance to pay they just need the first two pages of this, imagine if it’s a paperless model. You can do everything electronically as soon as you are done and you are happy with it, you submit directly to finance or procurement to finance and they have it on the system right in front of them. If they are happy then they just wait for the funds to arrive and they pay. That’s the same for on the procurement side as well. Exactly the same. Why should you every time submit such a thick document when all your statutory documents can be uploaded. You can enter your rates electronically into the BOQ, so automatically you can check the general compliance of the contractor. The BOQ is checked, so at least the evaluation part of the tender process is shortened.”

More so, the civil engineer stated that it is essential to have clear roles at each stage specifically an outline of who is responsible, and for what.

“I don’t need to go to whoever if I can approve something then I need to approve it, instead of it having to go to the division of the executive, the CEO. There is clearly defined things already but it’s not implemented. Basically there is some sort of distrust between us in our relationship. The main word these days is corruption. If we take something like the BMU’s and the cleaning of rest places, grass .., those are tenders that there is a lot of people competing for that. And just look at what it costs the organization to rent Avani. For 2 weeks. But that’s just the cost of the venue, that’s excluding the cost of the people that have to evaluate. Byes, because people need to travel from far. So there’s quite a few things that I think can enter into making things much easier. But one of the biggest things in my opinion that needs to be left out of project management ... and any ... is politics. Because currently we are being dictated by it doesn’t matter how much we plan, what we plan for, you just get a directive, go do this and all your planning that you have done is gone. Time is gone to waste and now without having any project you have to start this project and get it off the ground as soon as possible. So that just restarts the cycle. Imagine the amount of .. we don’t have time to plan for material, water, quantities as quickly as possible. Now when it comes to the execution of project management you be like “Oh I didn’t include this. We forgot to include this” so now all of those challenges start fresh. And then on top of that you are busy .. do this for us. You just get a call, please do this for us.”

Without outstanding the above, any directive that the civil engineers get to be executed has an impact on all the other projects because of other commitments. Therefore, any outside directive to do anything else has a direct influence on those contracts that were procured and existing commitments.

“If you just look at our approved budget for the year. We get X amount for what we have planned, now all of a sudden, a new directive comes in and we are being told to make provision out of the current budget. So other projects are getting pushed behind

just to attend to this new emergency. So, it doesn't matter how much we plan, how much we budget for as long as there is outside interference in our day-to-day activities is we will keep on struggling. That's why I'm talking about politics and outside interference. Yes, and then at the end of the day, certain road users are benefitting while certain road users are being left behind. if you look at one of our high volume gravel road in road 46, main tourist destination. It's supposed to be number one on the priority list currently it's not. There's other social roads that are taking priority over that and if you look at one of our key things is if you look at, we as RA we are only allowed to build economically ... roads which are funded by GRN separately. So now that in the change .. we are building roads. If you look at RFA, RFA was established to manage public funds forums ... and all of those things. RFA is currently funding projects outside their scope as well which already impacts what we need to do because like I said, doesn't matter how much we plan, if there's no money. Social roads need to be funded separately by GRN."

4.9 Certification and Qualifications in Project Management

Part of the findings that relate to qualifications have been discussed in the other themes, such as importance of project management in civil engineering. The current theme concerns certification of personnel who have qualifications in project management. This theme only had one subtheme (see Table 9).

Table 9 Certification and qualifications in project management

Themes	Sub-themes
Certification and Qualifications in Project Management	Stakeholders advocating for certified project managers in government projects

Stakeholders advocating for certified project managers in government projects: Potential requirement for project management knowledge were mentioned to qualify for government projects. The Project control engineer shared a memory of a discussion that happened with what he termed external stakeholders.

“Okay, maybe an interesting something, I remember the discussion that we had with some external stakeholders. They are trying to sensitize the GRN to try and ensure that their projects are done by, in fact they are trying to advise the GRN to say your projects needs to be done by project managers who are certified, who know what they are doing, regardless whether it’s construction, whether it’s in agriculture whatever area it is. So if those stakeholders get it right with the GRN then people who do projects, because now we even have teachers that are constructing roads like you don’t need to be an engineer anymore. So what this stakeholders are trying to sensitize the GRN is to say look for you to be able to achieve whatever project that you are within a specified budget, within a specified time, ensuring that the scope that was put out is what is being done. They are trying to tell the GRN to say look you should get certified people to do this things. Yah to be able to run those things. So if they get it right with the GRN, then everyone out there that is into project whatever sort it may be, they should try and get, go that through to say let me find some knowledge in this then I’ll be able to qualify to do GRN projects. Because now even I’ve seen some of our projects we have, there’s a project management firm, Monjila Project Managers, I’ve seen recently they are requesting for some of the information on projects and they are coming in from the ministry of, from the office of the Prime Minister. So I think the Prime Minister appointed them to sort of overlook some of their projects. Just to make sure that it’s done within the budget and the timeframe.”

Another participant concurred that the office of the prime minister has already taken the route of working with certified project managers.

“So you can imagine other ministries as well, if they go that route then it means people on the one end that are into the implementation of projects, they need to ensure that they acquire some project management background else they will be left out, they may not qualify to do projects for government.” (Project management planner).

4.10 Summary

The findings demonstrated that civil engineers employ project management processes and guidelines in construction projects. Furthermore, that those involved in managing the projects wish that all civil engineers should have a project management background and for other divisions that they work with civil engineers such as procurement unit, to also be acquainted with the importance of project management and its applicability. Consequently, the impact of project management was expressed threefold: the main constraints of project management which is time, quality, and scope; miscommunication and lack of understanding in other divisions; as well as the stakeholder engagement and contractor empowerment in project management.

In addition, all participants shared distinct challenges faced in managing the projects. The narratives of the interviewees reflect that definite efforts are made to promote project management in civil engineering. However, there is also a distinct rejection to welcome a change with regards to project management for effective and successful completion of projects.

The findings further confirmed the need for the organisational project management model. Irrespective of the implementation of project management and succession planning, much needs to be done to shed the air of scepticism that surrounds the competencies of the civil engineers who have been project managers for long. Moreso, the need to unify the divisions that work on construction projects for timely and cost-effective product. The findings also revealed that the stakeholders have started considering certification of project management qualifications.

The next chapter contains a discussion of the findings of the study as it relates to literature.

CHAPTER 5

DISCUSSION OF THE FINDINGS OF THE STUDY

5.1 Introduction

The preceding chapters illustrate the background and foundation of the study, a literature review, a detailed description of the methodology that was applied in the study and an outlay of the qualitative findings of the study. This chapter deliberates upon the findings of the study as these relate to the set objectives. The qualitative findings concern all the objectives of the study.

5.2 Qualitative data

5.2.1 The biographical data

All the participants were project managers by virtue of their positions as civil engineers. They have all achieved a bachelor's of technology in civil engineering, with the highest qualification being a PhD in transportation engineering. Four participants were male and two were female, amongst them two participants have been trained in project management, while others were knowledgeable through practice.

5.2.2 Objective 1: Assess the knowledge to which the Roads Authority civil engineers practice project management in their projects

Six themes emerged from the data. The discussion of the objective is aligned to the flow of the themes as displayed in Chapter 4, Table 3. In cases where the subthemes of one theme overlapped with subthemes of another theme the initial discussion was considered sufficient to prevent repetition of information.

5.2.2.1 Importance of Project Management in Civil Engineering

Project management was found to be the cornerstone of all civil engineering projects. The existence of a project management plan outlines what needs to be done in terms of execution at

each step and what needs to be done in terms of quality assurance. The success of every project depends on the civil engineer's expertise of project management. It was mentioned that several initiatives are ongoing simultaneously, particularly in maintenance, therefore all projects are being given attention. Therefore, project management has a significant impact. It essentially determines whether or not your projects are successful.

Project management, according to the civil engineering manager, is the organization and management of resources that includes procedures and technology to guarantee that a project is completed on schedule and within budget without sacrificing the quality of the service to be provided. While the participants agreed that project management is used in the work of civil engineers, Principal Material Engineer highlights the crucial element that project management plays in their line of work.

The requirement for expertise and experience in project management was discussed by the project control engineer. While bringing abilities to a task may be beneficial, the team may also learn from and support one another in areas where they are lacking. This will ensure that the projects are successful. The manager of civil engineering shared his observations regarding the level of work and the expense of oversight. The participant also emphasizes how greater divisional coordination and cooperation will enable effective resource management, which will reduce expenses as a result of individuals helping one another out where they fall short. The workforce will speak the same language and prevent project delays once everyone has a solid understanding of project management.

During some study interviews, it became clear that civil engineers needed to familiarize themselves with project management procedures and understand the principles that should be used at every stage of the project on a daily basis. Additionally, the participants felt that because so much time is spent debating what should and shouldn't be, working with people who lack project management knowledge is highly challenging. This point was also emphasized, emphasizing how difficult it might be to motivate team members who lack project management skills to hone or learn a necessary ability.

5.2.2.2 Application of project management

By utilizing all five process groups, project management may be used in the construction sector, which is the industry of practice. Without finishing the preceding phase, one cannot go to the next. The project management process groups that civil engineers use have five guidelines. Projects can be initiated, planned, carried out, monitored and controlled, and closed off. The manager of civil engineering relates to the fact that project managers are obliged to put project management into practice in their day-to-day tasks in order to increase productivity. However, the period of work monitoring and control is neglected. The engineer went on to say that he had brought project monitoring and reporting to his department.

The participants concurred that it is crucial to apply all project management principles to their responsibilities. Planning has also been cited as the most crucial component of project management since it gives civil engineers access to information about the project's timeframe and completion dates for each component. As a result, project management concepts are correctly used, money is allocated where it is needed, and projects are finished on schedule. Furthermore, the application should be used for both routine and periodic work, where routine refers to continuous (always the same) labour and periodic refers to work that is done in response to a particular demand.

The start and end dates for the contract duration should be determined by the civil engineers. After the deal is finished, they pinpoint, modify, and purchase for the same requirements. Additionally, it's important to clearly distinguish between project management and contract management. The project's execution strategy or the scope swapping across projects, in the participants' opinions, are expensive. This has an impact on the roles that weren't anticipated because altering the scope requires altering the project management concept, which has an impact on how it is applied across multiple projects at once.

The results on the knowledge of project management and its applicability support Haron et al.'s (2018) assertion that persons involved in project handling typically fail to adopt a proactive strategy to addressing uncertainties. As a result, projects frequently experience delays and budget overruns because possible risks are ignored. Lack of information and poor project management led to project cost overruns, completion delays, and early termination, which had a bad effect on the project team's reputation.

5.2.3 Objective 2: Establish the perception of Roads Authority civil engineers on the impact of project management in the construction sector

5.2.3.1 Impact of project management

The participants determined that project management is subject to three constraints: time, quality, and scope. To ensure that all construction projects are completed in the allotted time and budget, the organization should take these limits into account. It was implied that understanding the three restrictions contributed to the initiatives' success. The organization is likely to incur costs or additional costs as a result of the counterpart divisions' lack of urgency, the project management planner noted. The manager of civil engineering credited project management for its benefits. Since project management enables cost control inside the project, civil engineers are advised to lean toward it as nearly totally beneficial.

Resource allocation and effective time management are both guaranteed by project management. As a result, jobs are finished on time, and road maintenance frequency is decided, both of which speak to quality. According to a senior civil engineer, communication is crucial to projects. She presented an illustration of how poor communication resulted in samples being gathered that did not meet the necessary standards. The principal material engineer described project management as a comprehensive process that requires awareness of time, quality, and scope.

The procurement department was mentioned as being behind many delays in the construction industry that were mainly related to miscommunication, which impacts the projects negatively because it delays the whole project, and the civil engineers agreed that all the divisions within and outside the Roads Authority should be aware of the principles of project management to ensure that communication is clear and guided by the project needs. This comprises the government, contractors, project managers, and individuals from other divisions who are directly or indirectly involved in civil engineering projects. The principles or concepts of project management influence the quality of work.

5.2.4 Objective 3: Identify challenges encountered by the civil engineers in the implementation of the project management skills in Roads Authority

5.2.4.1 Challenges in Project Management

During data collection, participants stated their dissatisfaction with the projects attributed to the project management. Although the civil engineers were emphatic about the need for everyone on the construction project to have some knowledge of the subject, obstacles remain that prevent it from being realized. The participants agreed that the primary impediment to advancement in project management in terms of construction work supervised by civil engineers is reluctance to individual change in terms of upskilling. The project control engineer noted that it is much easier to complete projects or tasks with individuals who understand the fundamentals of project management. According to the Principal Material Engineer, a lack of project management abilities frequently costs time and money.

According to the survey participants' experiences, project fulfillment is not simply dependent on their departments, but numerous divisions are involved. This is a problem that must be solved in order for projects to run properly. Furthermore, the project control engineer stated that risk management is weak in their project management. The participants agreed that once the work has begun, the contractor cannot be halted. The contractor may seek standing expenses against the Roads Authority or civil engineers. To avoid such incidents, the contractor is instructed to continue working, for example, by instructing them to make the road a little wider and to suspend some actions such as slushing and brooming the road. The contractor builds the road with a gravel basis, but as soon as the engineers give their permission, he returns to the first section and begins slushing and brooming. The civil engineer in charge of road maintenance warns that the projects can only be completed to a certain point by civil engineers.

The work for civil engineers is divided into numerous divisions. The network planning that occurs with non-engineering divisions such as procurement has a greater impact on project time delivery. As a result, time, scope, and quality are jeopardized. Engineering offers the quality component via specifications. The Civil engineering manager cited resource constraints as another reason for the project's delay, along with the time and expertise necessary from the contractors. The Senior Civil Engineer emphasized that if more time is spent on the project

repeating a lot of things, then more time is spent on the total project rather than the specific money for a single action once. This causes a delay in the completion of the task.

A lack of personnel was also noted as a problem, as at least two or three road inspectors were missing. Because the team is understaffed, the project managers cannot be everywhere they want to be as often as they would want. There is a lack of interdependence among the divisions in working toward project completion. It was discovered that in order for the project to continue, the engineers needed to contact procurement for financing towards a specific scope. The principal material engineer provided additional information regarding the activities, specifically the milestones associated with delivery time. Several participants stated that there is no quality assurance in the projects, hence no one is motivated to deliver quality work.

The Principal Material Engineer noted that the model will urge the Roads authority to be strict because the Cape seal performance has already been completed. Based on the assessment, the civil engineers will know whether to install a rejuvenator and when it is a waste of money and effort to do so. This meant that installing a rejuvenator after eight years or before five years was a waste of money, but it should be guided by a set of rules derived from or included in the model to instruct civil engineers on what to do.

5.2.5 Objective 4: Establish strategies that can be employed to effectively improve the implementation of project management in construction projects by civil engineers

5.2.5.1 Organizational Project Management Model

The civil engineers emphasized that there isn't an organizational project management model in place, although they did concede that there are certain objectives and methods of operation in the various divisions. The concept should be applied to create valuable services and structures while using time and resources effectively. As a result, contractors start work promptly and use superior equipment rather than whatever is available, regardless of quality. The participants agreed that successful ventures require a stand-alone model. The organizational model for project management in civil engineering projects is necessary and crucial, the project management planner noted.

According to the civil engineers, the implementation of a standalone project management model should be accompanied by a comprehensive monitoring component that explains the procedure to all custodians and beneficiaries. The civil engineers reported that some other businesses had project management models in place that handle the majority of their project management-related duties. Time and project management are taken into account while making decisions about procurement, project execution, and oversight, among other things. As a result, these enable communication both within and between departments, enabling those in charge to ensure that projects are completed on schedule and within budget without sacrificing quality. It is necessary to establish an organizational project management model in RA and to raise awareness of the value of time and project management.

The chief material engineer advises that while a model for organizational project management is important, it should also be complemented by a set of rules that may be used as a compass while working on projects. The agenda must be advanced with the aid of the model rather than prioritizing items that do not require attention since they were planned years ago and are no longer feasible, the civil engineer continued. The model will provide information about current priorities based on needs.

According to the civil engineers, project managers should gain knowledge of project management not only through formal training but also by observing other organizations with project management offices. Participants were asked by the researcher to describe any project management solutions they have personally offered at their place of employment. The participants disclosed that they had discovered and implemented three to five processes that set deadlines and speeds. Everybody involved in the project management process now has roles that are clearly defined thanks to the advent of learning from other organizations. Participants disagreed, though, and claimed that other organizations had made their jobs simpler through the use of technology. In addition to technology, the principal material engineer stated his concern that it is difficult for the civil engineers to manage one project at a time. The efficiency of supervision is impacted by managing numerous contractors, particularly in terms of time.

Project control engineer, Project management planner, roads maintenance civil engineer, and Principal Material Engineer were some of the players who seemed to interact with stakeholders, contractors, and other divisions in order to align with the project management concept. Project management expertise and experience are thus necessary, provided that all relevant divisions

cooperate. The civil engineer for road maintenance explained the necessity of contingency measures in uncertain projects. The civil engineer went on to say that it is crucial to have distinct duties at each level, particularly a breakdown of who is accountable for what.

Despite the aforementioned, the execution of any order given to the civil engineers affects all the other projects due to other obligations. Therefore, any outside order to do any other action directly affects the contracts that were obtained and the commitments that already exist.

5.2.5.2 Certification and Qualifications in Project Management

To be eligible for government projects, it may be necessary to possess project management skills. The project control engineer recalled a conversation with what he described as external stakeholders. Another attendee agreed that the prime minister's office has already chosen to use professional project managers.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER RESEARCH

6.1 Introduction

The preceding chapter presented the research findings and interpreted them. This chapter reaffirms the purpose of the study and summarises the findings of the research. The chapter also suggests some recommendations that are founded on the findings of the study and offers a conclusion that is grounded on the researcher's own observations.

6.2 Purpose of the study

The purpose of the study was to assess the impact of project management on civil engineers especially in the construction industry. The study utilised three general approaches which includes quantitative approach that correspond to logical positivism world view, qualitative approach which works with transformative world view and triangulation approach which correspond to realism or logical world view. Interviews were conducted on the Road Authority Civil Engineers in Namibia.

6.2.1 The impact of project management on civil engineers in the construction industry (Primary research objective)

According to the study, all employees who participated in the study revealed Project Management is important for effective communication and leadership in engineering projects as it enable effective communication assist in mitigating risks, achieve objectives to stakeholders needs effectively.

6.2.2 To assess the level of knowledge to which the Roads Authority civil engineers practice project management in managing their projects in Namibia. (Secondary research objective 1)

In order to assess the importance of Project Management to the Roads Authority Civil Engineers, it is important to first establish their level ok knowledge in Project Management, enabling the researcher to draw conclusions on well informed findings. The participants have all demonstrated a higher level of Project Management all in formal education and through

experience gained in managing projects. To this it can be concluded that information gathered on the topic has a solid project management base and thus making it credible.

6.2.3 To establish the perception of Roads Authority civil engineers on the impact of project management in the construction sector in Namibia. (Secondary research objective 2)

All participants confirmed that project management is the foundation of success for civil engineering projects. Project management has an impact on the success of all projects. The participants also hinted on that it is challenging to work with people who do not have prior project management experience because time is wasted in debates on what should and what should not be, discussions which can be avoided if project management processes and principles were employed. Through analysis of participants information, the writer therefore concludes that, if project management concepts are applied, funds assigned where it is required then, projects will be completed on schedule and within budget. Additionally, this application should be used for both routine and periodic work.

6.2.4 To identify challenges encountered by the civil engineers in the implementation of the project management skills in Roads Authority, Namibia. (Secondary research objective 3)

The responses collected from participants through interviews reflected positive perceptions towards the availability of challenges in the organization with connection to implementation of project management skills. Participants hinted on the lack of effective communication between stakeholders which causes misunderstandings, delays, and cost overruns. Another challenge is the complexity of construction projects, which can make it difficult to manage resources. All cited challenges can be clearly solved with project management knowledge applications.

6.2.5 To establish strategies that can be employed to effectively improve the implementation of project management in construction projects by civil engineers in Roads Authority, Namibia. (Secondary research objective 4)

All participants cited project management principles and strategies which can be utilised to improve project implementation within the organisation. Covering communication, project management models and technology (software) applications.

6.3 Limitations of the Study and further research

The study was self-funded. Therefore, the researcher was not able to cover a larger geographical area due to the unaffordability of transport cost that prohibited the researcher from travelling to other parts of the country to conduct research.

Another limitation is the is the researcher's ability to remain objective through the data collection and analysis. As for all data which is subjected to interpretation there is potential for intrinsic in qualitative potential for biases.

Suggestions for Future Research Further research is recommended from a researcher who has no knowledge of Civil Engineering and Project management to establish a more defined relationship or lack of relationship between project management knowledge and project success.

6.4 Recommendations

With reference and support by the study results, the subsequent recommendations are submitted:

- It is recommended that Engineers be equipped with project management training applicable to the projects they manage. This is supported by the candidates interviewed as they all agree that project management knowledge is crucial to the success of the projects they manage.
- Organizational project management model implementation. It is recommended that Organizational Project Management Models be established in organizations which manages projects. This is supported by the research participants as they all agree such model will provide guidance and institute project management principles rather than the normal procurement principles that are not in line with correct project execution.

6.4 Conclusions

The observed the impact of project management in engineering with civil engineers in Roads Authority as a case study. The study outcomes were informative and verified an important and constructive relationship between the success of Engineering projects and Project management knowledge. The study is significant as civil engineers are the managers of the projects, project management implementation is essential to them in order to ensure sustainable growth of a nation`s economy and to create extensive linkages within the economy through success of project execution. The effective contribution of the study is its input to the body of knowledge in addressing the study objectives and answering the research questions thereby contributing to both practice and future research on the effects of staff motivation on employee performance and associated topics. Similarly, other organisations that adopt the recommendations of this study may enjoy the benefits.

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APPENDICES

Appendix A: Research Instrument

Key informant interview guide

Introduction

My name is Eustace Nfwambi Sibongo and I am a PhD student at the Selinus University of Sciences and Literature, conducting academic research for my degree qualification. My topic is entitled “*The impact of project management in engineering: a case study of the Roads Authority civil engineers, Windhoek – Namibia*”. You have been selected to participate in the study because your contribution is important, for it will contribute towards the implementation of project management for civil engineers in Namibia.

Participation is voluntary and you can choose not to take part. The information that you give will be confidential. There will be no way to identify that you gave this information. Ethical clearance will be sort form the Selinus University, ethics committee.

The interview will take approximately 45 minutes to an hour of your time.

1. Introduction of participants based on age, sex, highest level of education, employment duration, current position, and scope of work.
2. What is your knowledge on project management?

Probe:

What does it entail?

How often do you apply project management in your scope of work?

3. What is your perception on the impacts of project management in your work as a civil engineer?

Probe:

Do you think all civil engineers will embrace project management?

What are the positive impacts of project management in civil engineering projects?

What are the negative impacts of project management in civil engineering projects

4. What are your views towards incorporation of project management in your day-to-day work as a civil engineer?

Probe:

Do you think this is the right time to be conscious about project management as a civil engineer/project manager?

How can project management affect your work?

What process should be taken to incorporate project management?

What aspects of project management can civil engineers adopt in their work (all aspects/some aspects/aspects depend on project.)?

5. What have you observed in your organisation in terms of the practices of project management in realising your work?

Probe:

Do all project managers/civil engineers apply it in tasks?

Is there an appropriate use of the project management plan?

What practices did your organisation or company carryout to complete the active projects during the COVID-19 pandemic?

6. What challenges have you as a project manager encountered in the implementation of the project management skills in Roads Authority in Namibia? *Discuss*
7. In your opinion, what strategies can you propose for effective implementation of project management in projects by civil engineers in Roads Authority, Namibia? *Discuss*
8. If you had to participate in the implementation of project management, what would need to be done to support you to ensure the best possible dissemination?
9. Do you have any additional views to add to the discussion?

Thank you for your time.

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