UNIVERSITY OF KWAZULU-NATAL

Investigating causes of delays and cost escalation in project execution during Turnarounds

by

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Wherever use was made of work of others, it has been duly acknowledged in the text.

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Abstract

The main purpose of this dissertation is to evaluate the causes and consequences of delays in project execution and their impact on the success of the project. The research methods include qualitative and quantitative methods. Literature provides evidence that poor project management structure, poor planning and inadequate communication contribute negatively to the success of the project.

Project planning is an essential part of the project as it provides the tools to plan – the scope, cost, communication, quality, risk evaluation, time frame, integration and the total project management process. In the event that planning is not done properly by the relevant stakeholders the likelihood of failure in projects increases.

Understanding the root causes of failure provides the key elements that contribute to adequate methods of implementing corrective actions. This thesis will add value to the project management process as it will equip project managers to understand the main causes and consequences of delays in project execution and to formulate corrective actions in order to prevent delays in future.

This thesis points out underlying issues that cause delays; it also attempts to outline the challenges that result in delays and cost escalations; it analyses possible the statements asked in terms of common agreements towards the statements and recommend possible solutions that may remedy delays and avoid cost escalation issues during the execution phase of the projects in turnarounds or shutdown environments.

The major findings of this study identify poor communication, repetition of tasks, resource allocation, scope change, procurement process management, inadequate planning and budget estimates as major contributors to delays and cost escalation during project execution – these issues also result in cost escalation during project execution in turnarounds. It is recommended that Engen Refinery put some means together to improve in the above-mentioned issues.

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CHAPTER ONE

Introduction to Research

1.1 Background

The Engen Refinery plant is part of the Engen Petroleum Limited, which operates mainly in southern Africa. The refinery is in Kwazulu-Natal Province, in Wentworth south of Durban, where the crude oil is refined into different products including, but not limited to, petrol, jet fuel, LP Gas, diesel, oil, and other solvents and wax products.

Although Engen operates 24 hours 7 days a week, the plant has to be shut down occasionally for maintenance. These periods may range from two to eight weeks, during which time equipment is fixed/replaced and routine checks are done.

These shutdown periods are also used as an opportunity to implement most projects, especially those that could not be implemented during the normal run of the plant. In order to ensure that plant operations are not interrupted it is preferable to work on the equipment while the plant is not operational.

These shutdown periods are very limited in time – it is of the utmost importance to complete tasks within the given turnaround period in order to get the plant back on line in time to deliver products as scheduled to customers. If for some reasons these target periods for the shutdown are not met due to delays in one or other project, the impact becomes huge to the business.

1.2 Motivation of the study

This study aims to identify the main causes of delays in project execution and cost escalations during turnarounds. The outcome thereof will be used to implement preventative actions that will stop repetition in delays and cost escalations. The impact in terms of cost and reputation due to customer dissatisfaction when Engen cannot supply customers with products on time is huge, and it cannot be tolerated.

Understanding the main causes of the delays and the cost escalations will add value to the organization, when preventative actions are put in place to avoid repetitions. Things

will be done differently to complete tasks within schedule and saving costs, and most importantly to satisfy customers and maintain a good reputation.

The effects of delays at Engen Refinery include but are not limited to the following:

- The turnaround is not completed on time.
- The work extended hours to catch up, resulting in stress and fatigue.
- The organization has to import products that the refinery could not produce.
- The quality of work is compromised, resulting in much repetition of work.
- The budget is exceeded by huge amounts.
- Customer dissatisfaction.
- Image and reputation damage.

1.3 Focus of the Study

The study will focus on delays in project execution during turnarounds and cost escalation in those projects executed within the turnaround periods, specifically at the Engen Refinery plant.

The project management processes and its elements, which when applied correctly assist in the smooth execution of any project and in the prevention and reduction of delays, will be scrutinised. The cost of a project is coupled to the schedule; as the schedule slips the cost escalates.

The study will also target the personnel who are involved in the turnarounds, including the project planning department, project engineering section, supervision personnel, installation and construction personnel and the maintenance team.

1.4 Problem Statement

Refineries process crude oil into different products such as diesel, jet fuel, LPG, and others. The plant operates 24 hours a day every day, including weekends. Taking the operations conditions into account, it is clear that not all projects can be executed during normal operation of the plant.

Therefore the maintenance shutdowns are opportunities to execute most of the projects. The challenges are centred on completion of those projects safely, on time, within

schedule and without compromising quality. Although turnarounds are planned months in advance, delays and cost escalations are inevitable during the execution phase.

1.5 Objectives

- To gain understanding of the underlying issues that cause delays, and their root causes;
- To outline the challenges that result in the delays and cost escalations;
- To analyse possible solutions that may remedy the delays and avoid cost escalation issues during the shutdowns; and
- To make recommendations for corrective or preventative actions to avoid further delays and cost escalations, to the benefit of the refinery

1.6 Research Sub-Questions

The Questions related to the causes of delays:

- Can communication result in a project delay?
- Are project scopes clearly defined?
- Is there any scope change during execution?
- Are contracts getting awarded on time?
- Are resources allocated adequately?
- Is project execution done by experienced personnel?
- Are all stakeholders involved in the planning process?
- Is there quality control during project execution?
- Are materials procured on time?
- Are materials delivered on time?
- Are there any safety incidents during execution?
- Are the plants handed over on time to the executing team?
- Are the working hours too long during turnaround?
- Are there any incentives for a job well done?

The Questions related to cost escalations:

- Are the project supervisors experienced?
- Is communication managed correctly during turnaround?
- Are more people added to the job during execution, to speed up the job?

- Are the budget estimates done correctly?
- Is quality control managed by qualified personnel?
- What actions are taken with regard to poor quality?
- Is the procurement plan managed by a procurement manager?
- Is there any scope change during execution?
- Is the funds allocation adequate?
- If materials are not delivered on time do you pay more to expedite delivery?

1.7 Structure of the dissertation

The dissertation structure consists of six chapters summarised below.

Chapter One: A brief introduction of the whole study is given in this chapter. The background of the study, the focus and the motivation of the study are discussed. The problem statements and the research objectives are presented. The research questions are formulated and the limitations of the study are discussed. The chapter is concluded with a summary of the structure and layout of the dissertation.

Chapter Two: The literature review of the study is the focus of chapter two. The review outlines the theoretical aspects of project management and project execution, their core elements and all the related issues and aspects that are integral to project failure and success during execution, especially during shutdowns.

Chapter Three: In this chapter a study methodology is presented. The methods used to collect the data are discussed and the construction of the research instrument, pre-testing and validation of the data outlined. Data handling and analysis is explained and the limitations and ethical issues of the study considered.

Chapter Four: The results obtained from the questionnaires are presented in chapter four. Data were analysed using the SPSS package. The data were tabulated, and pie charts used to present responses from respondents to the questionnaires. Bar graphs were also used to present results. Results of Normality testing and Hypothesis testing were presented in this chapter.

Chapter Five: The analysis and the interpretation of the results were discussed in this chapter. Explanations of the results were done in relation to the literature presented in

chapter two. These discussions were based on the respondents linking the delay causes and the cost escalations.

Chapter Six: This final chapter of the study comprises the findings and recommendations of the study. The researcher seeks to find out if the objectives of the study were achieved and conclusions are drawn. Recommendations for further studies in the topic are proposed.

1.8 Limitations of the Study

This study investigating delay causes and cost escalations in turnaround projects is limited to projects executed at the Engen Refinery, during turnaround or shutdown periods. It is not concerned with other projects executed outside the shutdown periods, or projects outside Engen Refinery. The target sample size was limited to 20 personnel, including mainly supervisors, planners, project engineers and managers as they are intimately involved in the planning and executing of projects during turnarounds. Data were collected using developed questionnaires, which took about five minutes to complete.

1.9 Conclusion

This chapter discussed the introduction to research, the motivation and focus of the study, the problem statement and objectives. The limitations of the study were highlighted and a summary of the dissertation structure was presented.

The next chapter focuses on the literature relating to project management and the causes of delays and cost escalation in project execution. Various project processes and project management elements like the risks, communication, procurement, project planning and cost control among others, are reviewed. Project success and failures are discussed. The delays and cost overruns are also discussed in relation to the relevant literatures.

CHAPTER TWO

Literature Review

Project Management and its challenges, delays and cost escalations in execution

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2.1 Introduction

The literature review is centred around the research questions highlighted in the preceding chapter. The main factors are the causes of delays in projects, the scope definition, planning and safe execution. Poor communications, insufficient resources allocation, inadequate risk management and poor quality control during execution could directly result in cost escalations. Projects must be completed in record time to take advantage of the market and other opportunities (Budd & Budd, 2003). The project management process is reviewed to gain insight in the requirements of project management execution.

The scope, time, quality, communication, procurement, human resources, cost, integration and risk management will be briefly discussed. The research objectives aim to identify the causes and the consequences of the delays in project management in manufacturing plants, and to recommend remedial actions, including systems that will prevent such from happening in any project environment. The purpose is to identify the root causes, so that the remedial actions will address the causes from the roots.

Projects vary in size, scope, cost and time, ranging from small to big projects. The distinctive features of a project include but are not limited to, start to finish, project life cycle, a a budget with forecast cash flow, the activities, the use of the resources, a single point of responsibility, fast tracking and team roles (Burke, 2013).

2.2 Project Execution Management

Many activities and projects overlap within the manufacturing industries, especially during shutdown periods. Projects are executed to satisfy the project specifications. During the execution phase, it is required that a project is coordinated closely between the operations team, the manufacturing plant team, functional management, installation contractors, the commissioning team, sponsors and the start-up team. (Hagen & Park, 2013).

In PMBOK (2013) a project is defined as a planned temporal endeavour undertaken to create a unique product or offer a service within a limited time scale and allocated budget. It is in project management where the skills and the knowledge, tools and techniques are applied to the activities in order to meet the requirements. A project is initiated and a feasibility study conducted. In the next phase a concept is developed, followed by the basic engineering phase. Detailed engineering is conducted, after which procurement and execution take place. Only at this point the project is started up and closed out.

The main objective of a project in manufacturing organisations is to accomplish all tasks **safely**, on **time**, within **budget** and without compromising any **quality**. Sondalini (2009) stipulates that customer requirements will include safety, reliability in operations, schedule, budget, flawless start up, and no repetition of work. Most projects in manufacturing industries require the plant to be shut down, as work cannot be done safely while the plant is online. The shutdown steps consist of planning, pre-shut activities, shutdown and post-shut compliance (Sondalini, 2009; Cameron, 2014).

The projects and the project management occur in an environment that is broader than that of the project itself (PMBOK, 2013). The organizational goal should be aligned with the work intended to be carried out. That can only happen when there is a broader understanding of the context and business strategy. Project performance and execution are broadly influenced by the organizational culture, style and structure. Shared visions, missions and values and the common experiences and beliefs of members shape the organizational culture over time.

The regulations, policies and procedures, motivation and reward systems, the risk appetite, code of conduct and ethics, and organizational environment further shape the culture of the organization. The organizational structure may divide the project into the project as part of the functional organization and the project as a free standing part of the parent organization (PMBOK, 2013).

Delays result in major costs, as the project cost start to escalate. The project cannot deliver the results to the customers on time, meaning that the customer should source the product from somewhere else if possible or should wait until the delayed project is in a position to deliver.

The industry reputation is compromised, trust is destroyed and the investors have to pay more. According to Sharad (2015), engineering and construction projects put more effort and time into the technical aspects, safety and regulations requirements. This causes time lapse and cost escalation, and by the time implementation is required or due the socio-economic and industrial environment has changed.

The original scope of the project has to be revisited and reviewed, and results in many changes. According to Hoegl & Weinkaf (2005) it is very important to manage tasks' interdependencies, especially in a multi-team project in major manufacturing industries. Well-managed interfaces between project stages are very important for smooth execution.

The cost and schedule management process is necessary to ensure the project is completed within the allocated time and approved budget. This stage includes the resource planning, schedule development, cost estimation, budgeting, cash flow and cost control (PMBOK, 2013). The cost of resources required to deliver the project activities includes labour, material, services and equipment. According to the PMBOK guide, the project budget is determined using cost aggregation, which combines the costs of resources and the activity level into a work package. A reserve analysis is used to create a buffer against cost overruns whereas the risk analysis determines the amount of the buffer required. A historical data and funding limit is also used for project budgeting purposes.

2.3 Project Management Activities

Almost every industry is concerned about effective management of large-scale complicated projects. Most of the money in cost overruns is wasted due to poor planning while unnecessary delays happen as a consequence of poor scheduling (Render, Jr, & Hanna, 2012). The first step in planning and scheduling should be to develop the work breakdown structure (WBS). A strategic management theory would offer insights that could be leveraged to make organizational project management environments more effective through improved research foundations (Drouin & Jugdev, 2014).

The time, cost, resource requirements, predecessors and persons responsible for each activity are identified. Finding the critical path of a project is a major requirement as it

tells you what activities should not be delayed lest the whole project will be held up (Render, Jr, & Hanna, 2012). Project management activities include mainly resource planning, scope planning, budget planning, procurement management, risk management and communication planning.

The first four core elements of project management are safety, scope, schedule, and cost. Getting these four elements right, the fifth element, quality, will fall into place (PMBOK, 2013). Figure 2.3 below indicates how the core elements of project management eventually contribute to product quality. If one element is compromised quality will be affected.

Fig. 2.3 Elements of a project, extracted from (PMBOK, 2013)

Scope management involves planning and control of project scope consistence with regard to the objectives of the project (Anbari, 1985). Scope management calls for evaluation of the initial scope elements as well as subsequent modifications, to ensure compatibility with the other project elements and the overall project objectives (Anbari, 1985).

Time management is concerned with planning, scheduling, monitoring and control of the time element of the project. Cost management deals with the financial planning of the project, and the collection, organisation and analysis of actual cost data, in order to achieve the project cost objective. Quality management focuses on the assurance of the completion of the project within the standards relevant to the project (Anbari, 1985).

Human resource management is the strategic long-term, broad view of the human resources in the business. Communication management pertains to the formal and informal interactions of individuals and groups in the project teams across the organisation. Safety management ensures that project objectives are achieved without injury to workers or damage to equipment (Anbari, 1985).

2.3.1 Project Management Process

Projects are the vehicle by which business opportunities are turned into valued business assets. Successful projects are defined as the ones that are delivered on time, within budget, and meet established business objectives. If a company chooses and builds good projects, it could increase its revenues, decrease life cycle costs, and use less capital to achieve its business goals (Lavingia, 2003). The project management process relies primarily on project plans, as the project plans represent the scope of work that will be achieved through the plan (Rolstad°as, Tommelein, Schiefloe, & Ballard, 2014).

Construction engineering specializes in planning implementation of engineering construction projects to meet time, budget, and specifications. In the engineering field production planning, scheduling and quantitative methods are applied to manufacturing systems to achieve higher productivity (Kwak & Anbari, 2009). Engen Refinery is no different – the production activities take first priority over all other activities except safety.

For any project management system to be successful, it needs to follow a structured process. This process facilitates the optimal use of resources over the life of a project to maximize value (K. Yaghootkar, 2012). Desired outcomes of this structured process are to select the right projects by improving decision-making and to improve project outcomes through excellence in execution. Table 2.3.2 provides a summary of the deliverables of a structured five-phase project management process (PMBOK, 2013).

The first three phases of project management process prior to the full funding step are referred to as front end loading (FEL) and are crucial in determining project success. The five-phase gated process provides a mechanism for effective communication between decision makers, including multifunctional project team members like the business, technical, operations, maintenance and all other stakeholders aiming to achieve business success (Lavingia, 2003).

Table 2.3.1 Project Management process, extracted from (PMBOK, 2013)

Phase 1: Feasibility	Phase 2: Conceptual	Phase 3: Basic Engineering	Phase 4: Detailed engineering & Execution	Phase 5: Start-up & Close out
Test for goal and strategic fit Overall plan Class 1 Estimate	Generations of alternatives Develop expected value and Class 2 estimates	Fully define scope Develop detailed execution plan Refine estimate and funds approval	Implement execution plan Finalize business and operating plan Project review	Operate asset Evaluate and monitor performance Identify new opportunity

Schedule analysis reviews are used to review the quality of an established project plan. The schedule analysis evaluates the quality of the project plan, and provides an assessment of the viability of the base-line plan. After the accomplishment of the schedule analysis, the results should be shared with the project management team, so that they will be aware of the concerns.

2.3.2 Integration Management

The integration management stage includes the development of the project charter, the project management plan, management of the project activities, monitoring and the control of the project, management of the change control, and the project close out. Most causes of project failures and cost escalations in projects result from integration management that was not carried out properly at the beginning of the project. This leads to on-going changes and new requirements being added continuously to the project at a cost and causing time delays (PMBOK, 2013).

The scope of the work defines what the project will deliver. Stakeholders' expectations are based on a fully defined and fixed scope; however, a scope change during the execution of the project shatters all trust as time delays and costs start to increase. During the project integration the project management plan is developed – meaning that it is defined, integrated and coordinated, otherwise a recipe for delays and cost escalation is generated (PMBOK, 2013).

2.3.3 Scope Management

The scope is the most important element of project management, as it determines the activities of the project, and the duration, cost and resources required. Scope creep can happen in any project, resulting in time wastage, money wastage, and diminished satisfaction due to the fact that project value is not realized (Larson & Larson, 2009).

The input of the scope management process will be the goal setting and scope definition, supported by the scope description documents and a work break-down structure that is realistic. The process will be an on-going effort in change control. Output therefore will encompass the project acceptance, periodic evaluation and reporting of scope modifications and status at the close-out stage.

Scope creep adds more features or functions to the product, i.e. requirements that were not authorized at the beginning of the project. The effects of scope creep were not taken into account in terms of time and resources. It is caused by: lack of sponsorship and stakeholder involvement; the inconsistent process of collecting project requirements, unrefined scope definition; poor definitions of initial requirements; lack of foresight and planning; changes not following the change management process; and delays in decision making (Larson & Larson, 2009).

Scope management and planning should include the product scope description, the product acceptance criteria as well as the project deliverables, exclusions, constraints, and assumptions. The WBS process requires the three main sets of information to be included, namely the project scope statement, the required documentation and the organizational process assets (Anbari, 1985). Scope change during execution might be inevitable as stipulated by (Erlt, 2014). These changes happen when some equipment is opened, cleaned or inspected. The number of repairs changes, and there are some add-ons. This scope change should be managed and controlled very closely as it may result in huge cost and massive delays.

2.3.4 Time Management

It is the wish of everyone to complete a project timeously. Delays are not acceptable, because it results in huge costs, including production costs. Every activity has a time frame attached to it, and a delay in those activities may accumulate into huge delays if not monitored closely (Ertl, 2014). A successful project is defined as the one that achieves the objectives of the full scope, within schedule and authorised budget. In most

cases the budget is compromised to deliver on time. The sooner the organization completes the project the sooner it may reap the benefits (Patrick & Warchalowski, 2013). Conditions for reducing lead time should be that there would be no cost increase or project scope sacrifice and there are clear benefits to completing the project sooner.

The time management process will have inputs covering the project tasks, activities, durations, logic and resource availability. In the process scheduling techniques are used, such as the critical path method (CPM) and bar charts. The output of the time management process will be the schedules, milestones, key events and resource allocations, including the continuous monitoring, analysis and reporting of actual achieved targets against the schedule (Anbari, 1985).

Most project environments are uncertain. Task durations are estimates either based on past experience or guestimated, which results in some tasks completed earlier and others later than estimated (Patrick & Warchalowski, 2013). Multitasking of resources also makes it difficult to achieve project time lines as resources may not be available to complete a task in one project because the person is busy with another project somewhere else at the same time. Multitasking creates problems as no management or support group is available to manage potential delays. Some problems take longer to discover, and managers do not clarify tasks before assigning them to people (Sood, 2003).

Michelle Bowles once asked a question: “When a project goes off schedule, how can you make up lost time – without affecting team morale or quality?” According to William Wood time is arbitrary and relative, and he once said that time is an enemy to projects, yet time is an investment in success. “The shorter the time, the greater the risk for underachievement”. It is very important that the business is encouraged to take time to exchange ideas among business units (Bowles, 2011).

2.3.5 Cost Management

Cost management is one of the most primary functions of project managers. One of the core functions of project management is cost integrated with scope, quality and time management (Georgas & Vallance, 1987). Success of a project is measured through management of cost during the life cycle of the project. The client and the business are looking at the bottom line. Effective capital budgeting include the identification of the

environmental costs and benefits, which include the direct and indirect future liabilities, managerial costs, insurance and risks management (Selg, 1995).

Cost management is a key responsibility of project managers; this includes cost estimation. The ability to carry out accurate front-end costing, cost monitoring and cost reviews has a direct impact on the profitability of the project and the business success of the organisation (Ming, 2005). Accurate front-end cost estimation, effective work in progress cost monitoring and effective post-end cost review are difficult challenges that project managers are faced with. Cost management is concerned with carrying out accurate cost budgeting which assist in preparation for a competitive price proposal before the start of the project. Furthermore it is also concerned with the effective control of costs during the project development in order to meet the planned budget (Ming, 2005).

Cost management input covers the scope, schedule, material cost, equipment, labour, and all possible overheads. The process comprises generation of cost estimates, time-phased budgets, and the data collection of actual costs. It includes the application of techniques to compare actual plan and earn value methods, to see how the project is performing. Cost variations forecast and risk cost are monitored in this process (Anbari, 1985). Cost is inherent and not negotiable as it depends completely on the scope (Durrenberger). Managing construction activities properly would yield to the effective cost management of the whole project (Hertenstein & Vallancourt, 1997).

Cost saving in the executing of projects during turnarounds could be achieved by reducing the planning time and the executing time respectively. Planning includes the development of a detailed project plan for all the tasks (Douglis, 1998). The cost estimating process encompasses the economic evaluation, project investing cost and forecasting cost.

The economic evaluation occurs in the initial planning phase with the aim to evaluate the technical and economic feasibility and to determine if capital will be obtained to fund the project. The project investment cost tends to predict the future cost, including the production of budget, order of magnitude and definitive estimates (Douglis, 1998). Forecasting deals with future trends development and the assessment of probabilities, uncertainties and inflation that could occur during the project.

Future financial outcome is predicted by the economic evaluation, project investment and cost forecasting. As schedules slip cost estimates sometimes become disconnected from the project reality (Hullet, 2004). If the scope changes, and the duration of activities changes, what happens to the estimate? Well it was an estimate! The schedule is usually developed to a lower level of detail than the cost estimate.

The resources could be ramped up and down, but the costs related to that are ignored (Hullet, 2004). The purpose of cost estimation is to motivate the project to the organizational management and also to be able to plan and control effectively (Emhjellen, 2003).

A key question asked by Walt Berkey (2000) is "where in the schedule is your budget?" If the budget is not time-phased with the scheduled work on a consistent basis, then the earned value management, schedule performance and schedule variance will not be useful to either the project manager or the customer, or even to the organizational management (Berkey, 2000).

Another element of equating the actual progress in a project is the earned value. In a project values are earned through completion of activities. Earned value is the uniform measure of total progress of the project; it is the consistent method of analysis of project progress and performance. It forms the basic analysis of cost performance in a project (Wilkens, 1997). Earned value is effectively applied by creating a work breakdown structure (WBS) to divide the project into manageable activities. Activities to be scheduled that represent the entire project are identified, costs are allocated to each activity, and the project schedule is updated by reporting activity progress and by analysing performance data (Wilkens, 1997).

2.3.6 Quality Management

According to (Ertl (2014) the quality planning, quality assurance and quality control are included in this phase. This ensures that the project meets the intended objectives. According to PMBOK (2013) quality management should include the organizational processes that determine quality policies, objectives and responsibilities. This includes the quality plan, the quality assurance and quality control.

Quality management covers the performance of the project with respect to standards, and specifications required to achieve the project objectives. The input to this comprises

the operability, reliability, availability, maintainability, flexibility and safety compliance. In the process the quality is measured, conformance checked, inspection and testing carried out. Quality management outputs include testing and final acceptance of the project. The quality of design should be continuously be monitored and any incidence of non-conformance or deviation recorded and corrected (Anbari, 1985).

2.3.7 HR Management

The human resource leg in project management is one of the most important elements. It is impossible to achieve success in a project without the right team. How does one make effective use of the people allocated to and involved in the project? The human plan, i.e. project team acquisition, development and management, is critical for project success (PMBOK, 2013). Acquiring a project team that will execute the project is a correct step to project success. Without a team the project plan cannot be executed, thus either the project will fail dismally or be delayed.

To get resources allocated to the project the buy- in of top management should be won. Other department should also be willing to provide their resources to contribute to the project. The company's top management should be informed of the project and kept in the loop about the progress throughout the project life cycle. On completion of the pilot project, the project manager should hold company-wide sessions, inviting the top management, presenting detailed techniques applied to ensure success of the project (Khanna, 2012).

2.3.8 Communications Management

Without communication, nothing will work out! Communication should be planned, managed and controlled. The communication planning process involves documenting the information and communication needs of the identified stakeholders. The plan should include all stakeholders, and consider their specific interest and influence in the project (PMBOK, 2013).

Inputs into the communication plan include but are not limited to stakeholder register, stakeholder management strategy, enterprise environmental factors, and organizational process assets. Communication channels should be agreed upon and fixed for a project to avoid confusion (PMBOK, 2013). Communication tools like verbal and non-verbal methods should be used throughout a project.

Communications should be managed according to the agreed communication management plan, including the creation, collection, distribution, storing, retrieving and disposition of project information in accordance with the communications management plan. It is important to control communication as it has great potential to misinform and scare stakeholders (PMBOK, 2013). Thus effective communications should be managed appropriately.

2.3.9 Risk Management

Every project manager, sponsor and key stakeholder wishes for smooth execution of a project and minimal risk to manage. Gupta (2010) argues that all projects should be synchronised with turnaround or shutdown activities to avoid unnecessary delays; Albrecht & Spang (014) share these sentiments. According to Nielsel (2006), project risks have to be re-evaluated based on the availability of resources and the allocated budget, in order to de-scope, increase the scope growth or reduce the scope of the project.

Risk identification is the most important process in the risk management phase. It should receive proper attention in order to prevent taking risks inadvertently. Risk identification is done through brainstorming, SWOT analyses, checklists and interviews (Hillson, 2000). Risks are unknown problems and issues which are uncertain or irrelevant concerns that should not affect the project.

The risk management process includes identifying, analysing and responding to risks (PMBOK, 2013). Causes are definite events that exist in a project and give rise to uncertainty, whereas risks are uncertain events which, if they occur, will affect the project objectives. Effects are unplanned variations from project objectives, which result from the risk occurring, e.g. delays and exceeding of authorised budgets. The most common error is failing to distinguish between causes and effects of risk (Hillson, 2000).

Risks consist of the *unknown-unknowns*, where there is no information about the activity, e.g. thinking you will join the cable and when trenching, one finds out that joining is not possible, and one needs to purchase new cables. Risks may also comprise of *known-unknowns* where partial information is available. Risks where information is available are *knowns*, for example the new equipment position is not the same as the old one and the cable will be short, and new cable will be required (Dey, 2012). The risk

management process seeks to address the genuine risks identified. Identified risks should be recorded, the underlying causes revealed and the impact clarified (Hillson, 2003).

The critical uncertainties that are assessed by the engineering team are not the only risks as there are also unrealized risks. These are risk areas in a programme that are not planned for as part of the scope of the programme, and as such they are not included in the current project plan. Such risk areas have a certain likelihood of occurrence and could become critical if they are realized. They would need to be accounted for and added to the scope of the programme (Quilliam & Elliot, 2010).

Unrealized risks need to be included as part of the schedule risk assessment. The engineering assessment team will determine a quantifiable schedule impact for each of these risks. The risk inputs will be included with the critical uncertainties as the results of the schedule risk assessment. The uncertainties should be tracked because including both the critical uncertainties and risks, provides both an understanding of the programme and accountability of the cumulative risks in the total programme (Quilliam & Elliot, 2010).

Critical uncertainties and risks become the significant inputs to the schedule risk assessment results. It is important to take the time and effort to set up a comprehensive approach to understand and identify the key risk areas. This allows for a more robust assessment of the true variability to the programme. It is also important to determine at what level the schedule risk assessment should be conducted. In most cases, well-justified and thought-out uncertainties will be a small subset of the overall activities in the plan. This allows for an understanding of the magnitude of the uncertainty and the appropriate risk strategies to apply. It also ensures that project resources are allocated to the right tasks at the right time and provides reasonable, realistic, and defensible forecasts for project schedule and cost parameters. This will allow the team to develop and execute the appropriate risk response plans (Quilliam & Elliot, 2010).

The risk situations in the initiation and planning processes are the ones that can turn into major harm to a project. All those identified risks are well-known facts, but unfortunately not always taken seriously. The lack of stakeholders engagement at the beginning – and not agreeing and recording the risks and allocate them to individuals to deal with – can cause delays, cost problems, changes of project directives and failures.

Furthermore, insufficient information and documentation for acquisitions denotes a lack of clear coordination of activities (Alves, 2004).

2.3.10 Stakeholder Management

Performing an in depth analysis of the stakeholders is important to the success of the project as it results in a clear roles and responsibilities of the key stakeholders. The client's responsibilities to facilitate interactions between consultants, construction contractors and key stakeholders are crucial to the success of the project (Doloi, 2013).

The PMBOK guide (2013) argues that stakeholders' expectations, people coordination, resource allocation and management, and the integration and performing of the project activities according to project plan, become the primary objectives at the execution phase. The project execution may require planning updates and base-lining. Stakeholders should be part of the process, or at least be informed about any changes and the effects thereof. Duration of activities changes, priorities are revisited and resources re-allocated (Zaini & Damit, 2009).

Stakeholders' expectations are very important in any project; they may be unrealistic but they make a difference in the perceptions of whether the project was successful or not. In manufacturing plants, it is expected that after a shutdown or project implementation, the conditions and the manufacturing processes should be improved. Most stakeholders would like project managers to hear their concerns and expectations. It is important to act fast (McCurtis, 2014). Stakeholders should be given regular status updates. The frequency will depend on the severity of issues at hand and support required.

2.3.11 Procurement Management

The procurement plan should include the contract types, bidder meetings, proposal evaluation techniques, procurement negotiations, and finally the contract awards. The key players in procurement management are the buyer and the seller. The risks associated with the procurement should be identified and managed accordingly.

The procurement control measures should take into account the contract changes, procurement performance reviews, inspections and audits, claims administrations force majeure situations, and liquidated damages (PMBOK, 2013). Delays in the procurement

process will result in delays in the project and that might attract costs, for instance standing time.

2.3.12 Conflict Management

Although conflicts are not necessarily bad, they should be managed properly lest they result in delays and tensions among the project teams. Project managers are faced with conflict on a daily basis. These conflicts emanate from external and internal sources (Pinto & Kharbanda, 2015), due to the fact that stakeholders are not willing to understand other parties' interests.

Conflicts may results in uncovering more information about the project and the risks involved during arguments and deliberations. Competing for scarce resources, violations of organizational norms, disagreements over project goals and the means to achieve those goals, the threats to job security, and prejudices are common sources of conflict (Pinto & Kharbanda, 2015). Other causes of conflicts include reward systems, uncertainty over lines of authority, and differentiation.

During project execution, the level of conflict escalates and is fuelled by the desire to satisfy others. Team members start to compete, as they intend to satisfy their own concerns. This may result in frustrations and less interaction among the teams and delays are imminent. Some team members may accommodate or avoid conflicts while other may collaborate and compromise for the sake of project success.

Project managers need to resolve negative conflicts as early as possible, and instil the idea of working together to achieve the project objectives. A number of issues should be considered about the conflict and project managers should be flexible and accessible and prioritise the situations for interventions (Pinto & Kharbanda, 2015). Not all conflicts should be confronted or avoided. Confrontation is best dealt with in problem solving meetings. Managers are required to expose the underlying causes of conflict. All parties should have an opportunity to put their issues out for resolution. Conflict can be handled successfully if the project preferences are clearly understood.

2.3.13 Benefits of Project Management

Project management benefits are realized by everyone involved in the project management process (Picariello, 2014). This includes the manager who oversees the project, the client who wants the project completed successfully and the production

team who are interested in using the installed facility to produce and make profits. A set of tools, skills, knowledge and techniques are used to manage projects in a most cost effective and efficient way to meet stakeholders' expectations.

The benefits include the efficient delivery of project end results, by working smarter and avoiding bumps and humps along the way. Improvement in customer satisfaction when projects are delivered on time and within budget constitutes another benefit. An opportunity is provided to expand the services, and better flexibility in managing risks is offered by raising the red flags in time and providing alternatives to remedy the situation (Picariello, 2014; Chaouni, 2015). The quality and effectiveness is increased while the focus is narrowed to reach the desired goals with minimum effort.

2.4 Project Success

Project managers should on an on-going basis consult people who work in physically dangerous conditions, work overtime or with people they dislike, or change product designs. Effective project managers master the twin challenges of achieving the work while preserving or enhancing personal relationships. The handling of unpleasant tasks is the highest test of leadership ability (Githens, 2012).

Influencing is a style of collaborating and inspiring others to accept and perform unpleasant tasks. It works at all levels, i.e. with superiors, subordinates, and peers. When done correctly it results in projects success. In the role of project manager one may request a senior person or a peer to perform an unpleasant project task. They might be the only one available, or hold the needed technical expertise, or have the organizational position to make a commitment. For some executives, making a basic decision is unpleasant: it forces them to a commitment, for which they might be held accountable! (Githens, 2012).

Effective influencers provide information that is relevant to the needs of the senior person or a peer. Influencing is a core project management skill, particularly important when you don't have a formal position of authority. Unpleasant tasks requires one to do his or her homework, especially when dates and costs are involved, otherwise failure is inevitable (Githens, 2012).

Githens (2012) emphasizes that project managers should welcome objections, which can include questions such as the following: Is there really a problem? Is it important?

To whom? Are the skills available? Why do you think we are competent to handle the task? Is there a simpler solution? What's in it for the organization, or business? What are the inherent threats and punishments? What are the real requirements? Ideal outcomes? Minimum conditions? (Githens, 2012).

The medium of the communication is as important for project success as the message. An impersonal note or message suggests that the sender does not care enough to become involved and desires emotional distance. An informal memo, newsletter, or email is an ineffective and possibly counter-productive way to announce a change or to motivate and direct people to accomplish an unpleasant task (Githens, 2012).

Project success also lies in the trustworthiness of the team members – they need to make a commitment to the truth. People are more willing to place their trust in an authentic team. Do not sugarcoat, tell the truth. If there are hazards, communicate them openly. Hazards might involve threats to personal safety, security, or ego. Threats to safety and wellbeing might command *all* the attention. Project managers should address the factors that would lead to dissatisfaction first, and then search for solutions that provide protection from these threats (Githens, 2012).

For success in project management the project leader should take the first step to lead the way. Followers look at actions more than they listen to words. The project manager should learn to develop some empathy – the mutual understanding derived from shared experiences is important among the team as empathy underlies trust. People who have mutual empathy are more likely to accomplish the needed work and preserve good interpersonal relationships. Vulnerability and authenticity keep people participating in the communication process. Don't withhold information about your feelings. People want to know your reactions (Githens, 2012). One will probably not achieve a deep level of trust with strangers, but it is possible to cooperate and avoid manipulation. “Seek first to understand and then to be understood” by Steven Covey is valuable advice when communicating about project tasks which tends to be unpleasant most of the time.

Project success depends on implementation of the actions. One may spend endless hours discussing problems and finding solutions, only to discover the group and its individuals have not taken action, hence there will be no success. Another key success factor to

project management is consensus. Although people might not agree with the idea, they might agree to support the idea (Githens, 2012).

2.5 Project Failure

Frequently it is heard that a project is a dismal failure, that over-expenditure resulted in the funds being exhausted before completion, or that time overruns are measured in months, sometimes years. The final product of such a project where it emerges lacks the planning features, and has unexpected performance failures (Budd & Budd, 2003). Some companies claim that their project was never late, but they are not referring to the original schedule and cost.

Causes of project failures as outlined in the PMBOK (2013) are poor communication, insufficient resource planning, unrealistic schedules, poor project requirements, lack of stakeholder buy-in, undefined project scope, unrealistic budgets, insufficient risk planning, and lack of change control processes. If one or more of the above-mentioned happens in a project the chances are that the project will fail, or be delayed, with resultant increased costs. The concept of project success and/or failure has not been well-defined anywhere in project management literature (Muller & Judgev, 2012).

Failure is also an imprecise and ill-defined term used by both practitioners and in the literature, without deep meaning. Muller and Judgev (2012) argue that there is no consensus on the concept of success in either business or project management literature. These authors also claim there is no definitive set of factors leading to project success (Muller & Judgev, 2012). The project control issues that could cause delays and consequent failures include: inappropriate delay allocation; inadequately detailed baseline schedule; incorrect logic and interfaces in the baseline schedule; infrequent schedule updates; incompetence in analyzing the schedule; no contractual treatment of scheduling methodology; no industry-wide consensus on delay analysis procedures; contractors lack awareness of delay impact on the project. In some cases, smaller projects would benefit from the use of a delay analysis system, but utilization of the delay techniques is not integral to success (Hyvari, 2006).

Several techniques could be used to avoid failures in a project, including resource levelling for activities. Some managers feel that resource levelling requires a lot of effort with minimum gain. The impacted activities costs can be easily determined by the

project manager (Hyvari, 2006). The cost of resources, especially manpower, should be readily obtainable by reviewing the weekly timesheets. A scheduling software package that has the capabilities of assigning resources to each activity is then used for the input of cost and resource data. Once the resources are assigned to the impacted activity, a leveling algorithm should be applied. A cost per day can be ascertained. Once the cost-per-day rate is established, it should be multiplied by the total duration of the impact to determine actual impact costs (Hyvari, 2006).

A second technique to mitigate failure is the near-critical analysis: this refers to those activities that are not in critical path, but could easily turn into critical paths if left unnoticed. Other techniques used to avoid failure include team development of the baseline schedule; concurrent delay recognition; delay coding structure; weather delays analysis; and the subcontractor-specific window analysis (Hyvari, 2006). It is important for the planner to filter out only the subcontractor's activities and determine his critical path. The window analysis will be performed by inserting the alleged impacts into the subcontractor's critical path. If this critical path is unaffected, the subcontractor will not be granted any entitlement for delay and the claim will be discarded (Kohler, 1999).

2.6 Delays and Cost Overruns

Cost overruns are referred to as the project's capital expenditure, which is the development cost of the project done by cost estimate departments in an organization. Unclear project assumptions in the early phase and the optimistic interpolation of the previous project assumptions, optimistic estimates and underestimation of uncertainty are the key reasons of cost overruns (Emhjellen, 2003). Cost estimation in the construction industry is considered difficult to do and that results in considerable cost overruns.

Schedules and cost form basic inputs for project performance, yet accurate reporting on both of them is still a challenging activity. Project controllers need to know how much has already been spent on the project, how much still has to be spent and how the project is performing against targets (Bergerud, 2012).

Stakeholders of manufacturing industries would like be in production continuously without interruption; as a result pressure is applied on the project manager to finish within the allocated time even if it is not realistic (Sharad, 2014). This results in scope

creep and cost escalations. The project manager has a prime responsibility to see to it that cost, productivity and schedule are managed properly. Continuous planning, updating, measuring, and controlling of the project activities require working together with all stakeholders and project members.

The most important factor in the success of the project execution in manufacturing industries is proper project planning. Communication and coordination with all stakeholders involved should be exercised with fairness and accuracy and be crystal clear. Resource planning should link and match the complexity of the activities involved (Cameron, 2014). A key factor that causes cost overruns and delays of most projects are not necessarily the lack of skilled people on the project team, but rather the inaccurate assessment and definition of the process (Wood, 2000).

According to Wood (2000) delays are caused by requirements not previously documented and understood. He argues that in reality delays and cost overruns can be controlled and reduced dramatically, to the extent that greater acceptance and satisfaction are achieved at all levels. Both employees and management should view change as an opportunity for improvement, and not challenge their existence. All stakeholders should be involved from the onset to avoid morale issues and to manage their expectations and fears. Most organizations have difficulty in providing accurate project performance information on time to clients and senior management (Bergerud, 2012).

A factor contributing to cost growth is early contractor estimates which are unrealistic, which are submitted to secure a contract. Other factors are related to contract changes, scope growth, inflation, delays, corrections of deficiencies, and unrealistic schedules (Budd & Budd, 2003).

Delays in projects leave the project manager with few choices such as to work overtime, and injecting additional resources, in order to meet the project schedule for certain activities. Excessive amounts of overtime may contribute to losses in productivity and reduced quality in projects. The people may become exhausted, with no energy to perform at the optimal level. A project manager may be confronted with additional costs, a decline in quality and re-work (Tse & Love, 2003). The project manager also has options of authorising overtime and/or injecting additional resources in order to meet the project's schedule.

Whereas injecting additional resources could significantly increase project costs, prolonged overtime work may cause declines in productivity and performance, which may also generate re-work (Tse & Love, 2003). It should be noted that in the three possible situations arising from delay, quality decline and re-work generation, are in fact, a source of additional costs. In the case of a decline in quality, the additional cost is implicit. Furthermore, a decline in quality will usually contribute to re-work being experienced, thus it is not difficult to convert the amount of quality decline into a cost equivalent (Tse & Love, 2003).

Cost and schedule overruns could occur due to a wide range of causes on various types of projects. If project costs or schedules exceed their planned targets, client satisfaction would be compromised. The funding profile would no longer match the budget requirements and further slippage in schedule could result. The resulting effects would be detrimental especially in the case of developing countries whose wealth measure is greatly dependent on their performance in infrastructure provision through the construction industry, especially on road construction projects which constitute a major component of the industry (Kaliba, Munya, & Mumba, 2009).

In construction, delay could be defined as the time overrun either beyond completion date specified in a contract, or beyond the date that the parties agreed upon for delivery of a project. A project slipping over its planned schedule is considered a common problem in construction projects (Assaf & Al-Hejji, 2006). The owner sees delay as a loss of revenue through lack of production facilities and rentable space or a dependence on present facilities. In most cases the contractor sees delay as higher overhead costs because of a longer work period, higher material costs through inflation, and labour cost increases.

To be able to complete projects on time is an indicator of efficiency – however, the construction process is subject to many variables and unpredictable factors, which result from several sources. The sources include but are not limited to the performance of parties, resources availability, environmental conditions, involvement of other parties, and contractual relations (Assaf & Al-Hejji, 2006).

2.7 Contractor Engagement

According to Kaisen (2014) contractor engagement has become the most important element in the success of projects executed in manufacturing industries. Contractors carry out most of the construction projects. They should understand the technical and safety procedures, policies, philosophies and standards, to avoid confusion and incidents that may cause delays (Dey, 2012).

The synchronisation of executable tasks is important for on-schedule task completion with full scope (Gupta, 2011). Ricci (2010) suggests that there should be a check list when engaging contractors to ensure that the most important steps are covered. The check list should include but not be limited to scope of work; legal agreements; copy of all relevant policies and procedures; background checks; timesheets to be used; invoicing procedures; proof of insurance and contract agreements.

Chesm (2012) argues that accountability with consequences should be clearly established for both the contractor and the company employees during the engagement process. The targets must be established for both lagging and leading indicators, for performance during the shutdown period. The contractors and their employees should be oriented beforehand about the company and the conditions they will be working under.

2.8 Project Execution

Project execution includes detailed design, construction, installation, commissioning and start up. The gist of project execution is centred around construction and installation, as this is where the results are produced. Pitfalls of all the other phases surface during execution and any attempt to correct those results in delays. Most delays are measured in terms of cost and time (Yates & Eskander, 2002). The knowledge management in project execution is a process and depends on how people can best integrate their individually held knowledge assets. Successful knowledge integration leads to successful programmes and projects (Levin, 2010).

If a project is not delivered on time and within budget it is automatically classified as a failure, irrespective of the quality standards. However, delaying the project and overspending on the budget to achieve quality is also perceived as a failure. These elements need to be balanced through proper planning and resource allocation. Project

delays are not predictable; however, each delay has its own risk factor (Yates & Eskander, 2002).

The longer it takes to execute the project the more the expensive the project becomes, due to project team costs, changing interest rates, inflation, scope changes, and cost of construction. In project execution, change orders during construction projects are a particularly irritating and costly problem for clients and contractors and a time-consuming effort for project managers, but are inevitable (Al-Tabtabai, 1999).

It is recognized that some changes during execution are necessary; however, they are also time-consuming and costly compared to the cost of the original scope of work for a construction project. International contractors working with different clients need to recognize the principal causes of changes and why there is a lack of understanding about the effect of these changes on a project's cost and schedule (Al-Tabtabai, 1999).

The change orders may have advantages and disadvantages; however, if it results in cost escalation and schedule slippage the project is automatically classified as one of those that did not achieve the objective in terms of cost and schedule. Therefore project governance is of utmost importance to project management (Hjelmbrekke & Lohne, 2014).

Change orders are classified as directed and constructive. A directed change is easy to identify: the owner directs the contractor to perform work that differs from that specified in the contract or is in addition to the specified work. Directed change may also be deductive in nature; that is, it may reduce the scope of work called for in the contract. Disagreements tend to center around questions of financial compensation and the effect of the change on the construction schedule (Al-Tabtabai, 1999).

A constructive change that is a major source of construction disputes is an informal act authorizing or directing a modification to the contract caused by an act or failure to act. A constructive change arises when the contractor alleges that something that the owner has done, or failed to do, has resulted in a de facto change in the contract requirements. The argument, of course, is that the contractor is entitled to extra compensation for performing the work.

The contractor must claim constructive change in writing within the time specified in the contract documents in order to be considered. The owner should evaluate a change

order proposal based on such a claim and could use the same reasoning process as any other proposal. Most constructive change disputes center around the interpretation of the plans and specifications (Al-Tabtabai, 1999). The causes of changes may result from client-related characteristics, project–related, project organization or environmental factors.

Client-related factors are based on the owner realizing during the course of construction that some items should be added, moved, or removed. Budget considerations may dictate changes during the course of the work. The owner may desire to occupy a part of the facility early and, as a consequence, change the contractor's sequence of work. When an owner initiates an action that requires performance different from what was specified, a change occurs (Al-Tabtabai, 1999).

Organizational factors involve the different disciplines with different objectives generating different contract strategies and organizational structures as well as styles of management. This often creates problems of coordination and communication, affecting variations in terms of number, agreement of cost and/or value, and if disputes arise, how they are resolved (Jerbrant, 2013). These factors include method of procurement, type of contract, method of tendering, adequacy of information, and number of sub-contractors used in a specific project (Al-Tabtabai, 1999).

Project-related factors depend on the construction of the project, also on the uniqueness of the project, by trying to accommodate the different designs, sites, and construction methods. Environmental factors include all external influences of the construction process, such as the economy of the country, social, political, and technology elements (Al-Tabtabai, 1999).

2.9 Causes of Cost Escalations

Ibbs & Reginato (2002) argue that organizations employing project managers with high project management maturity may actually make a project cost less than projects run by their counterparts that are less mature. Managers sometimes escalate commitments by increasing the spending on the project. Cost estimates often become disconnected from the project reality as schedules slip. Cost estimators sometimes stick to their estimates even when project components and activity durations change (Hullet, 2004).

A schedule variance in most cases signals a cost variance, where the cost variance is the difference between the budgeted cost and the actual cost for the work. Any variance has to be investigated and reported. Timely analysis of cost variance could assist in establishing problems and correct them before they become serious (Christensen, 1993). More realistic estimates will provide assistance in surfacing problems while there is still enough time to resolve them.

A cost overrun is the adverse cost variance, either currently or at completion. The cost performance index measures the cost overrun; if it is less than one it means that for every rand spent, less than one rand of work is completed, therefore an overrun is experienced (Burke, 2013). The schedule performance index compares how the project is doing against schedule and cost baseline.

Without a realistic estimate it is difficult to get the real picture, and project managers may have a false sense of security about the progress of the project which will result in failure to take appropriate actions to correct the problems (Christensen, 1993). Variance analysis requires proper attention and proper culture. In an organization where management has a 'shoot the messenger' culture, it is unlikely that problems will be reported on time, as there is a fear of being shot down.

Another way of measuring project performance is to use the Earned Value Management (EVM). This assists project managers to measure project performance. It is a systematic project management process used to find variances in projects based on the comparison of worked performed and work planned. The EVM is basically used for the cost and schedule control and it could be very useful in project forecasting. The project baseline is an essential component of EVM and serves as a reference point for all EVM-related activities. EVM provides quantitative data for project decision-making (Fostel, 2011).

When delays in approval occur beyond what had been planned, individual activities will effectively be delayed; however, there might be a tight time constraint, so that the project cannot simply be extended. In such a case management will have to adapt the project, overlapping future planned activities with delayed activities. Consequently the design of interrelated components has to be changed to allow activities to run in parallel. Individual design activities take longer, since each activity has to take cognisance of the other interrelated activities which now have to be scheduled concurrently (Williams, Eden, Ackermann, & Tait, 1995).

2.10 Project Recovery

In order to recover a project an intervention is required. Timing of the intervention is very important, as it influences the recovery scope. An approval from key stakeholders is required for an intervention to be successful. Recovery will require less effort and cost when attended to earlier rather than later (Bailey, 2000). It would be easier to identify if a project requires recovery if the project performance thresholds are clear.

The common characteristics of troubled projects include but are not limited to: poor definition and management of scope, schedule, cost, and quality baselines; inaccurate and untimely communication; unrealistic resource allocation; poor vendor performance and contract management; poor identification and containment of risks; poor understanding of intra-project and inter-project dependencies (Bailey, 2000). Contractual obligations should be considered when implementing recovery measures, as contractors might call for additional budget to perform recovery activities.

Project recovery planning defines the road map to be used to implement the recovery recommendations and outlines the key focus areas. The recovery closure points should be clearly defined. Completion criteria for recovery should determine when and under what conditions normal project execution can resume. Recovery planning should also include a plan for transfer from recovery to normal project execution (Bailey, 2000). The recovery schedule should be integrated into the overall project plan.

Recovery execution includes the scope, the WBS, exit criteria, and scope management plan; the resource leveled schedule and management plan; the staffing management plan; the cost baseline and management plan; the risk management plan; the communication plan; the quality management plan; the contract and vendor management plans; and the integration management plan. Other key activities concern improving the project manager's capability and include reinforcing the project manager's roles and responsibilities, training him or her to better manage the remainder of the project, and reinforcing the accountability for failure to maintain project control (Bailey, 2000). The project recovery should be closed and the project should return to normal project execution as soon as the problems are resolved.

2.11 Conclusion

This chapter highlighted all the aspects of project management in any organization. The possible causes of delays and cost escalation were considered. It was pointed out that costs are always linked to the schedule at all times. The EVM contributes to: preventing scope creep; improving communication and visibility with stakeholders; reducing risk; profitability analysis; project forecasting; better accountability; and performance tracking (Dwivedi, 2015). It is difficult to separate cost and schedule when measuring project performance and success. The next chapter will be dealing with the research methodology that is followed in this research in order to achieve the objectives of the research.

CHAPTER THREE

Research Methodology

3.1 Introduction

This chapter describes the methodology used to conduct research for this study at Engen Refinery. The research problem, as stated in chapter one, focuses on investigating the causes of delays and cost escalations in project execution during shutdowns or turnarounds.

According to Sekaran & Bougie (2014) there are several research strategies, which include experiments, survey research, observation, case studies, grounded theory action research and mixed methods. The quantitative method is based on some measurements and expressed in terms of quantities. In qualitative research qualitative phenomena are used to determine the underlying motives and desires using depth interviews relating to turnaround execution and delays. For the purpose of this study a mixed method approach of *quantitative* and *qualitative* research methods was selected. A survey was conducted using questionnaires that were sent out to a sample population. The collected data were analysed and conclusions and recommendations drawn from the survey results.

Attitude and opinion questionnaires were used to determine how people feel and what they thought were the causes of delays during shutdowns. Validity of the information was maintained through consistent administration of the data collection process. Relevant managers and supervisors were selected to participate, not individuals who were far from the action of executing projects during the turnaround period. The information liability is very important, to avoid and minimise biasness as much as possible, so that a true reflection of the situation is obtained. Following Sekaran and Bougie (2014), the data collection process was designed such that it was simple and easy to use by both researcher and respondents.

3.2 Objectives of the study

The objective of the study is to identify and gain understanding of underlying issues that cause delays in turnaround projects and their root causes. The study should be able to outline the challenges that result in the delays and consequently the cost escalations. The study should also recommend possible solutions that may remedy delays and avoid cost escalation issues during shutdowns and suggest corrective or preventative actions to avoid further delays and cost escalations, to the benefit of the refinery.

3.3 Construction of the Questionnaire

The questionnaires were constructed such that responses would provide answers to achieve the objectives of the study. The questions were as brief as possible. Clear instructions were given at the beginning of the page to either tick or cross or circle the answer to each question that the respondent believed to be true. A simple, clear and unambiguous language was used, avoiding leading questions. Effort was made to make the respondent's task as simple as possible.

Of the 26 questions asked, 15 were related to the causes of delays in project management during execution and 11 to the causes of cost escalations during project execution. The management of Engen Refinery granted permission to conduct the study with the refinery personnel (Appendix 3).

The purpose of the study was explained in a covering letter (Appendix 4). A covering letter with a consent form was designed and issued to participants together with the questionnaires, explaining that participation in the study was voluntary and confidential. Participants were ensured that they could withdraw from participating in the study at any point, with no negative consequences.

3.4 Recruitment of Study Participants

The respondents were the project managers, project engineers, planners, cost controllers and supervisors. The participants were recruited through informal discussions regarding the issues, costs and delays that are experienced during project execution. This was done to make it easy for them to agree to participate in the study without asking too many questions.

3.5 Pre-testing and Validation

It is important that the questionnaires are understood by participants, and that the wording does not confuse the respondents (Sekaran & Bougie, 2014). Pre-testing of the study is required to be done in order to determine the types and quantity of responses that is likely to be received (Leedy & Ormrod, 2005). The purpose of pre-testing is to ensure that there will be reasonably enough responses to satisfy the questions asked, in order to achieve the objectives of the research questions.

Three respondents were given hard copies of the questionnaires to answer, to test their comprehension. A few questions that confused them were rephrased to clarify the meaning and to avoid bias. The main purpose of the pilot study was to assess if the instructions were clear and the language and terminology understandable. Furthermore, from the pilot study it could be ascertained whether all areas of focus were taken into account, and completion time for the questionnaires could be estimated.

3.6 Reliability

A phenomenon can be adequately measured when it can also be consistently measured. The reliability measures the consistency of results yielded by a measuring instrument, when the entity measured has not changed (Leedy & Ormrod, 2005). Instruments designed to measure psychological characteristics tend to be even less reliable than those designed to measure physical phenomena.

Cronbach's alpha is a reliability coefficient that indicates how well items in a set are positively correlated with one another. According to Sekaran & Bougie (2014) reliabilities less than 0.6 are considered poor, those above 0.7 are acceptable and above 0.8 are considered good.

Reliability Statistics	
Cronbach's Alpha	Number of Items
0.624	26

The Cronbach's Alpha for the 26 statements was 0.624. This means that the internal consistency reliability of the measures used in this study is considered to be marginally acceptable.

3.7 Administration of the Questionnaires

The research was carried out through a number of designed questionnaires to collect the data from the relevant respondents. Questionnaires were personally administered to the respondents in hard copy. Respondents were asked to answer the questionnaires and appointments were made to collect the questionnaires within three days. The challenge was that after the three days the questionnaires were still not completed. Constant encouragement and follow up were done until some questionnaires were completed.

3.8 Limitation of the Study

The major limitation of the study is that the results obtained cannot be generalised to different circumstances. The questionnaire design was selected to provide answers to the specific mode of operation of the Engen Refinery turnarounds project execution. These operations could be influenced by various factors like organizational structure, culture, operational philosophies, and operational environment.

The other major limitation is that the targeted population is simply the people who are involved in the project execution, like the supervisors, planners, engineers and project managers; however, their experience, training and qualifications were not necessarily taken into consideration.

Getting these people to participate in the study was not easy, due to their daily work pressure – they were reluctant to spend time to answer the questions, resulting in a slow respondent rate.

A probability sampling method was used in this study due to the limited number of participants. A systematic was adequate as the target was the project managers, planners, engineers and supervisors. The whole population size is limited to twenty personnel. The whole population was sampled.

3.9 Data handling

The research data were collected from respondents in hard copies which were scanned and stored in a PC that is password protected. The original hard copies will be stored in a file and submitted to the supervisor. The data will be stored and disposed of according to university policies and procedures.

3.10 Data Analysis

The data was captured using MS Excel and later exported to SPSS (originally named Statistical Package for the Social Sciences and now called Statistical Product and Service Solutions) for analysis. SPSS is a powerful computer program which is used to carry out a wide variety of statistical analyses.

Descriptive statistics such as the mean and the median were used to summarise the data. The Kolmogorov-Smirnov Test of normality was used to assess whether variables were normally distributed or not. When applying the Kolmogorov-Smirnov Test, the null hypothesis stated that the variable came from a normally distributed sample against the alternative hypothesis that the variable came from a population that was not normally distributed. A p-value of the Kolmogorov-Smirnov test greater than 0.05 indicated that the variable is normally distributed and a p-value less than 0.05 indicated that the variable is not normally distributed.

The One-sample Wilcoxon Signed Rank test, which is a non-parametric test used to establish whether a median for a variable differs significantly from a hypothesised value – in this case the mid-point of the scales (0) – was conducted. It is analogous to the One Sample t-test when the data is normally distributed. A median value significantly greater than the mid-point of the scale was considered to imply that the respondents agreed with the statement whereas a median value significantly lower than the mid-point of the scale was considered to imply that most respondents disagreed with the statement.

3.11 Ethical issues

"The business ethics for research refer to a code of conduct or the expected social norms of behaviour when conducting a research" (Sekaran & Bougie, 2014). The ethical conduct will apply to the organisation, and the members that sponsor the research, the researchers and the respondent who provide the data (Michalos, 2014).

Sekaran & Bougie (2014) emphasized that the observance of ethics begins with the person instituting the research, and should do so in good faith, pay attention to the results and pursue not self-interest but organizational goal instead. The behaviour of the

researchers who conduct the investigation should also reflect the ethical conduct. The participants who provided the response data, the analyst providing the results, and the entire team who interprets the results and make recommendations should observe the ethical code. The confidentiality of this information is safeguarded and governed by the business ethics (Michalos, 2014).

Ethical issues when collecting data should be addressed by treating the information given as strictly confidential. Privacy should be the primary responsibility of the data collector. The study should not be mis-represented; personal information should be treated with sensitivity. Respondents should not be forced or coerced, maltreated or harmed in any way and the information should not be distorted (Sekaran &Bougie, 2014).

3.12 Conclusion

This chapter gave an overview of the literature and methods relevant to the research methodology and a discussion was presented on the data types obtained for analysis. The questionnaires were presented in this chapter, as well as the sample size and the covering letter. The data handling, storage and disposal were discussed.

The research methodology is important in executing the research in order to meet the research objectives. In the next chapter, chapter four, the collected data will be presented in tabular form, and graphical expressions for analysis.

CHAPTER FOUR

Results Presentations

4.1 Introduction

Data collected from questionnaires are presented. All respondents were given the same set of questions to respond to, by ticking or circling the answer he or she believed relevant to the question. Their responses were recorded in the tables and figures below.

4.2 Respondent results

The responses of the respondents are recorded in the tables and figures below in a simplified way. Table 4.2.1 shows the overall responses regarding the delays causes and the cost escalations experienced in project execution during turnarounds. Table 4.2.2 records the results of the Kolmogorov-Smirnov test for normality to ascertain the appropriateness of the statistical techniques used to test the hypothesis. Table 4.2.3 records the results of the One-sample Wilcoxon Signed Rank test to assess whether the respondents agreed or disagreed with the statements in the questionnaire.

Test for Normality

The Kolmogorov-Smirnov test for normality was used to assess if the variables were normally distributed. This was done in order to ascertain the appropriateness of the statistical techniques used to test the hypothesis. If the data is normally distributed then parametric tests will be conducted but if the data is not normally distributed then the non-parametric tests will be conducted. The hypotheses for each of these items were as follow:

Ho: The variable is normally distributed

H1: The variable is not normally distributed

A variable will be normally distributed if the p-values for the Kolmogorov-Smirnov Z are greater than 0.05 otherwise they are considered to be not normally distributed. The results are shown in Table 4.2.2.

Table 4.2.1. Respondent results

	Total			R_1			R_2			R_3			R_4			R_5			R_6			R_7			R_8			R_9			R_10			R_11			R_12			R_13			R_14			R_15			R_16			R_17			R_18			R_19			R_20			Percentage		
Questions	Yes	Sometimes	No	Y	S	N	Y	S	N	Y	S	N	Y	S	N	Y	S	N	Y	S	N	Y	S	N	Y	S	N	Y	S	N	Y	S	N	Y	S	N	Y	S	N	Y	S	N	Y	S	N	Y	S	N	Y	S	N	Y	S	N	Y	S	N	Y	S	N	Y	S	N	Y	S	N
CAN DELAYS DURING TURNAROUNDS BE AVOIDED?	16	4	-		1		1			1			1			1			1				1		1			1			1				1		1			1			1			1				1		1			1			1			1			80%	20%	0%
Can Poor Communication result in a project delay?	18	2	-	1			1			1			1			1			1			1			1			1			1			1			1			1			1			1				1		1			1				1		1			90%	10%	0%
Are project scopes clearly defined?	9	9	2		1		1				1				1		1		1			1				1			1		1				1		1			1				1		1				1				1	1			1				1		45%	45%	10%
Any scope change during execution?	13	7	-	1				1			1		1			1				1		1			1			1				1		1			1			1			1				1			1		1			1				1		1			65%	35%	0%
Are contracts getting awarded on time?	7	10	3		1		1				1			1			1		1				1		1				1		1			1			1				1			1			1			1				1			1	1					1	35%	50%	15%
Are resources get allocated adequately?	7	9	4		1		1					1		1			1		1				1		1				1		1				1		1					1		1			1		1					1	1				1				1	35%	45%	20%
Is project execution done by experienced personnel?	9	10	1		1		1			1				1		1				1		1				1			1		1				1		1				1			1			1		1					1	1			1				1		45%	50%	5%
Are all stakeholders involved in the planning process?	5	10	5			1		1			1				1	1				1				1	1					1		1			1		1					1		1			1		1				1		1				1			1		25%	50%	25%
Is there quality control during project execution?	13	7	-		1		1				1			1		1			1			1				1			1		1			1			1			1				1		1			1				1		1			1			1			65%	35%	0%
Are materials procured on time?	6	10	4		1		1				1			1			1		1					1			1		1		1				1		1				1			1			1			1				1			1	1			1			30%	50%	20%
Are materials delivered on time?	7	10	3		1		1			1				1			1		1					1			1		1		1				1		1				1			1			1			1		1					1	1				1		35%	50%	15%
Any safety incidents during execution?	18	-	2	1			1			1			1			1			1			1			1			1			1			1					1	1			1			1			1					1	1			1			1			90%	0%	10%
Are the plants handed over on time to the executing team?	6	9	5		1				1		1			1			1			1				1	1				1				1		1		1			1			1			1			1					1			1		1			1		30%	45%	25%
Are the working hours too much during turnaround?	9	3	8	1			1			1					1			1		1				1			1	1			1			1					1			1			1	1					1		1		1				1		1			45%	15%	40%
Are there any incentives for job well done?	4	4	12			1			1	1					1			1		1		1					1			1		1				1	1					1		1				1			1	1				1				1			1	20%	20%	60%
CAN COST ESCALATION DURING TURNAROUNDS BE AVOIDED?	14	4	2	1					1	1			1			1			1					1	1			1				1			1		1			1				1		1				1		1			1			1			1			70%	20%	10%
Are the project supervisors experienced?	9	11	-		1			1		1				1		1				1		1				1			1		1				1		1				1		1			1				1			1			1		1			1			45%	55%	0%
Is communication managed correctly during turnaround?	6	12	2		1			1		1					1	1				1				1		1			1		1				1		1			1				1			1		1				1			1			1			1		30%	60%	10%
Do more people get added to the job during execution, to speed up the job?	11	8	1		1			1			1			1		1				1		1			1				1		1			1			1			1					1		1		1			1			1				1		1			55%	40%	5%
Are the budget estimates done correctly?	5	10	5			1		1			1				1	1				1			1			1				1	1				1		1				1			1			1			1				1			1	1			1			25%	50%	25%
Is quality control managed by qualified personnel?	7	10	3		1			1			1				1		1			1				1		1			1		1				1		1					1	1			1			1				1		1				1		1			35%	50%	15%
Are actions taken for poor quality work?	11	6	3	1					1	1				1		1			1			1				1		1				1				1	1				1				1		1		1				1		1			1			1			55%	30%	15%
Is the procurement plan managed by procurement manager?	9	8	3			1		1				1	1			1				1		1			1					1	1			1			1				1			1			1			1		1				1			1		1			45%	40%	15%
Is there any scope change during execution?	12	8	-	1				1			1		1			1				1			1		1			1			1			1				1		1				1		1			1			1			1				1			1		60%	40%	0%
Are funds allocation adequate?	3	10	7			1		1			1				1		1			1			1				1			1	1				1			1		1				1				1		1				1			1		1		1			15%	50%	35%
If materials not delivered on time do you pay more to expedite?	13	5	2	1					1		1		1			1			1			1			1			1				1		1				1		1				1		1				1		1			1			1					1	65%	25%	10%

Table 4.2.2. Kolmogorov-Smirnov Z test for Normality

Tests of Normality			
	Kolmogorov-Smirnov[a]		
	Statistic	df	P-value
Can delays during turnarounds be avoided?	0.501	18	0.000
Can Poor Communication result in a project delay?	0.523	18	0.000
Are project scopes clearly defined?	0.279	18	0.001
Any scope change during execution?	0.421	18	0.000
Are contracts getting awarded on time?	0.287	18	0.000
Are resources get allocated adequately?	0.225	18	0.017
Is project execution done by experienced personnel?	0.294	18	0.000
Are all stakeholders involved in the planning process?	0.222	18	0.019
Is there quality control during project execution?	0.392	18	0.000
Are materials procured on time?	0.253	18	0.003
Are materials delivered on time?	0.260	18	0.002
Any safety incidents during execution?	0.523	18	0.000
Are the plants handed over on time to the executing team?	0.225	18	0.017
Are the working hours too much during turnaround?	0.288	18	0.000
Are there any incentives for job well done?	0.342	18	0.000
Can cost escalation during turnarounds be avoided?	0.463	18	0.000
Are the project supervisors experienced?	0.334	18	0.000
Is communication managed correctly during turnaround?	0.301	18	0.000
Do more people get added to the job during execution, to speed up the job?	0.346	18	0.000
Are the budget estimates done correctly?	0.222	18	0.019
Is quality control managed by qualified personnel?	0.245	18	0.006
Are actions taken for poor quality work?	0.376	18	0.000
Is the procurement plan managed by procurement manager?	0.276	18	0.001
Is there any scope change during execution?	0.392	18	0.000
Is funds allocation adequate?	0.245	18	0.006
If materials not delivered on time do you pay more to expedite?	0.406	18	0.000

No = -1, Sometimes = 0 and Yes = 1

It will be noted that none of the items were normally distributed since all the p-values were less than 0.05. The rest of the analysis will be conducted using non-parametric tests since the variables are not normally distributed.

Hypothesis Testing

The 26 statements were measured on a 3-point scale which was coded as -1 for No, 0 for Sometimes and 1 for Yes. The hypothesis was to assess whether the respondents

agreed or disagreed with the statements. The One-sample Wilcoxon Signed Rank test was conducted for each statement against the midpoint of the scale (0). Thus, the hypotheses were as stated below:

Ho: The respondents rated sometimes on each statement (median for each statement=0)
H1: The respondents did not rate sometimes on each statement (median for each statement≠0)

Results are shown in Table 4.2.3.

Table 4.2.3. One-Sample Wilcoxon Signed Rank test

Null Hypothesis	Median	Test	P-value	Decision	Mean
The median of Can Poor Communication result in a project delay? equals 0	1	One-Sample Wilcoxon Signed Rank Test	0.000	Reject the null hypothesis	0.900
The median of Can delays during turnarounds be avoided? equals 0	1	One-Sample Wilcoxon Signed Rank Test	0.000	Reject the null hypothesis	0.800
The median of Any safety incidents during execution? equals 0	1	One-Sample Wilcoxon Signed Rank Test	0.000	Reject the null hypothesis	0.800
The median of Any scope change during execution? equals 0	1	One-Sample Wilcoxon Signed Rank Test	0.000	Reject the null hypothesis	0.650
The median of Is there quality control during project execution? equals 0	1	One-Sample Wilcoxon Signed Rank Test	0.000	Reject the null hypothesis	0.650
The median of Can cost escalation during turnarounds be avoided? equals 0	1	One-Sample Wilcoxon Signed Rank Test	0.003	Reject the null hypothesis	0.632
The median of Is there any cost scope change during execution? equals 0	1	One-Sample Wilcoxon Signed Rank Test	0.001	Reject the null hypothesis	0.600
The median of If materials not delivered on time do you pay more to expedite? equals 0	1	One-Sample Wilcoxon Signed Rank Test	0.005	Reject the null hypothesis	0.550
The median of Do more people get added to the job during execution, to speed up the job? equals 0	1	One-Sample Wilcoxon Signed Rank Test	0.004	Reject the null hypothesis	0.500
The median of Are the project supervisors experienced? equals 0	0	One-Sample Wilcoxon Signed Rank Test	0.003	Reject the null hypothesis	0.450
The median of Is project execution done by experienced personnel? equals 0	0	One-Sample Wilcoxon Signed Rank Test	0.011	Reject the null hypothesis	0.400
The median of Are actions taken for poor quality work? equals 0	1	One-Sample Wilcoxon Signed Rank Test	0.033	Reject the null hypothesis	0.400
The median of Are project scopes clearly defined? equals 0	0	One-Sample Wilcoxon Signed	0.035	Reject the null	0.350

		Rank Test		hypothesis	
The median of Is the procurement plan managed by procurement manager? equals 0	0	One-Sample Wilcoxon Signed Rank Test	0.083	Retain the null hypothesis	0.300
The median of Are contracts getting awarded on time? equals 0	0	One-Sample Wilcoxon Signed Rank Test	0.206	Retain the null hypothesis	0.200
The median of Are materials delivered on time? equals 0	0	One-Sample Wilcoxon Signed Rank Test	0.206	Retain the null hypothesis	0.200
The median of Is communication managed correctly during turnaround? equals 0	0	One-Sample Wilcoxon Signed Rank Test	0.157	Retain the null hypothesis	0.200
The median of Is quality control managed by qualified personnel? equals 0	0	One-Sample Wilcoxon Signed Rank Test	0.206	Retain the null hypothesis	0.200
The median of Are resources getting allocated adequately? equals 0	0	One-Sample Wilcoxon Signed Rank Test	0.366	Retain the null hypothesis	0.150
The median of Are materials procured on time? equals 0	0	One-Sample Wilcoxon Signed Rank Test	0.527	Retain the null hypothesis	0.100
The median of Are the plants handed over on time to the executing team? equals 0	0	One-Sample Wilcoxon Signed Rank Test	0.763	Retain the null hypothesis	0.050
The median of Are the working hours too long during turnaround? equals 0	0	One-Sample Wilcoxon Signed Rank Test	0.808	Retain the null hypothesis	0.050
The median of Are all stakeholders involved in the planning process? equals 0	0	One-Sample Wilcoxon Signed Rank Test	1.000	Retain the null hypothesis	0.000
The median of Are the budget estimates done correctly? equals 0	0	One-Sample Wilcoxon Signed Rank Test	1.000	Retain the null hypothesis	0.000
The median of Are funds allocation adequate? equals 0	0	One-Sample Wilcoxon Signed Rank Test	0.206	Retain the null hypothesis	-0.200
The median of Are there any incentives for job well done? equals 0	-1	One-Sample Wilcoxon Signed Rank Test	0.071	Retain the null hypothesis	-0.368

No = -1, Sometimes = 0 and Yes = 1

The results show that the null hypothesis was rejected for the following statements since the p-values were less than 0.05 and thus the median rating was not equal to zero. An assessment of the mean rating shows that the mean ratings for the statements were greater than zero and thus, the respondents were agreeing with the statements.

The null hypothesis was retained for the rest of the statements listed below since the p-values of the One-Sample Wilcoxon Signed Rank Test were greater than 0.05. This means that the respondents could not agree with the statements.

Graphical Results

Below are the graphical results from the respondents' responses to the questions asked.

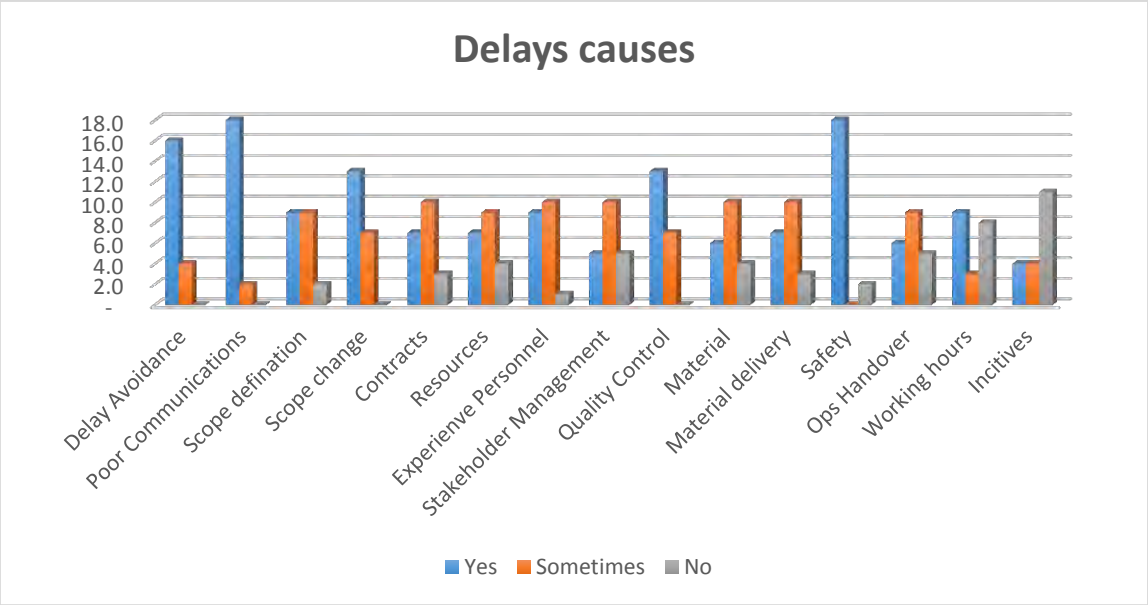

Fig. 4.2.1. Delays causes

Figure 4.2.1 shows the responses relating to the causes of delays in project execution during turnarounds.

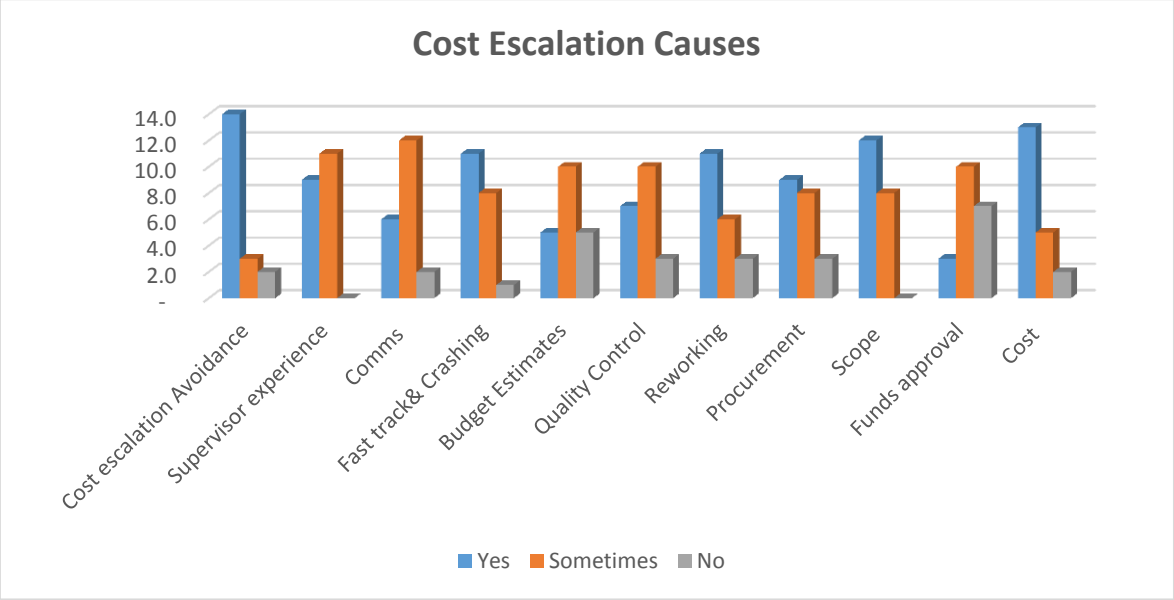

Fig.4.2.2 Cost escalation

Figure 4.2.2 shows the responses relating to the reasons for cost escalation in project execution during turnarounds.

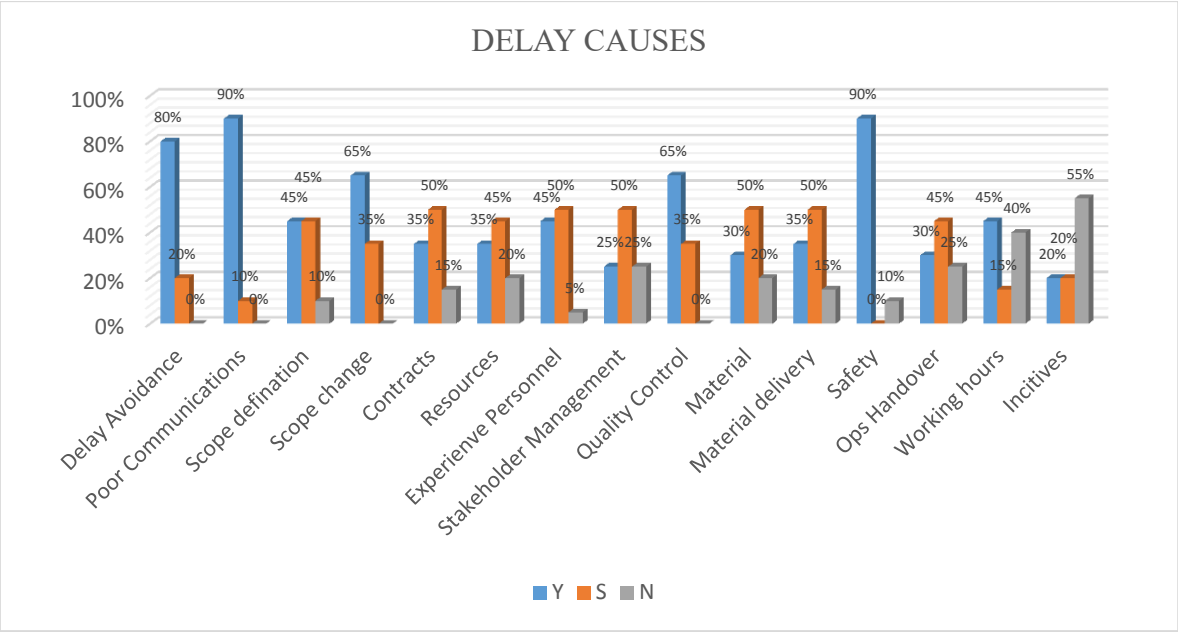

Fig. 4.2.3 Delays in percentage

Figure 4.2.3 shows the respondents' responses in percentage relating to the causes of delays. Y=Yes, S= sometimes, N= No.

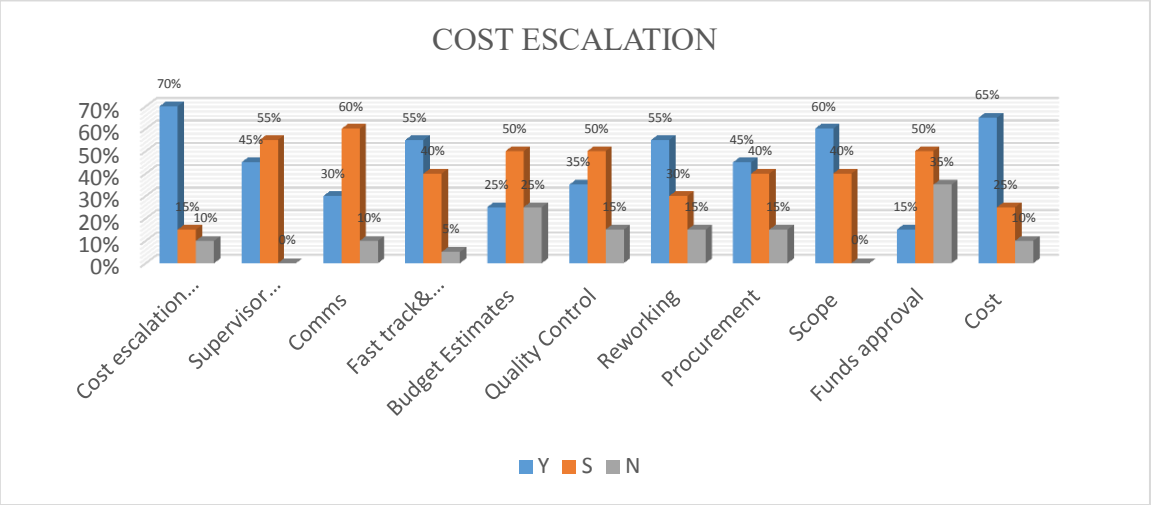

Fig.4.2.4 Cost escalation in percentage

Figure 4.2.3 shows the respondents' responses in percentage relating to the cost escalation. Y= Yes, S=Sometimes, N=No.

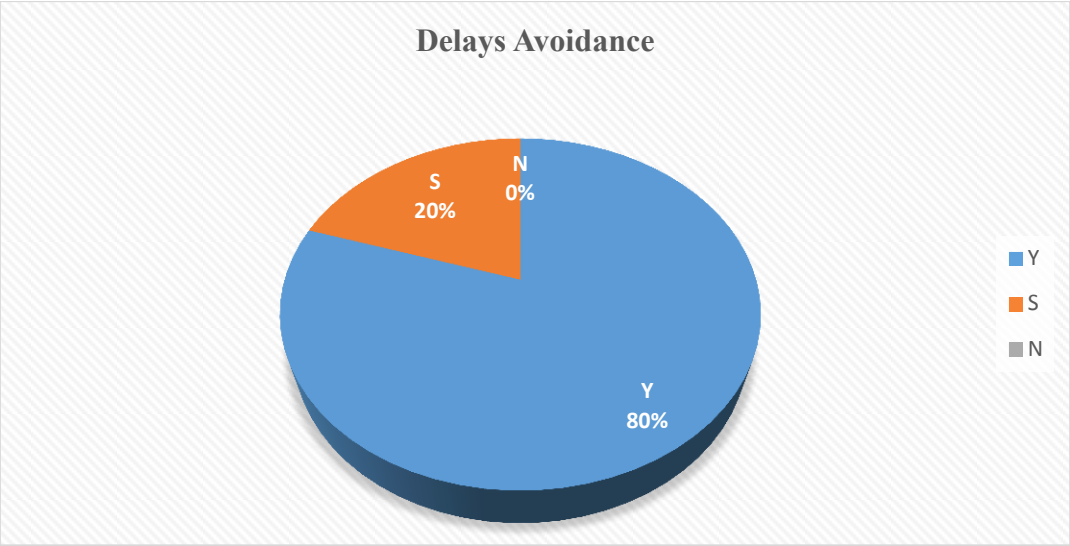

Fig. 4.2.5 Delays avoidance

Figure 4.2.5 shows the responses relating to respondents who believe that delays in project execution can be avoided during turnarounds. The results indicate that 80% of the respondents agreed that delays can be avoided and only 20% are uncertain and no one agreed.

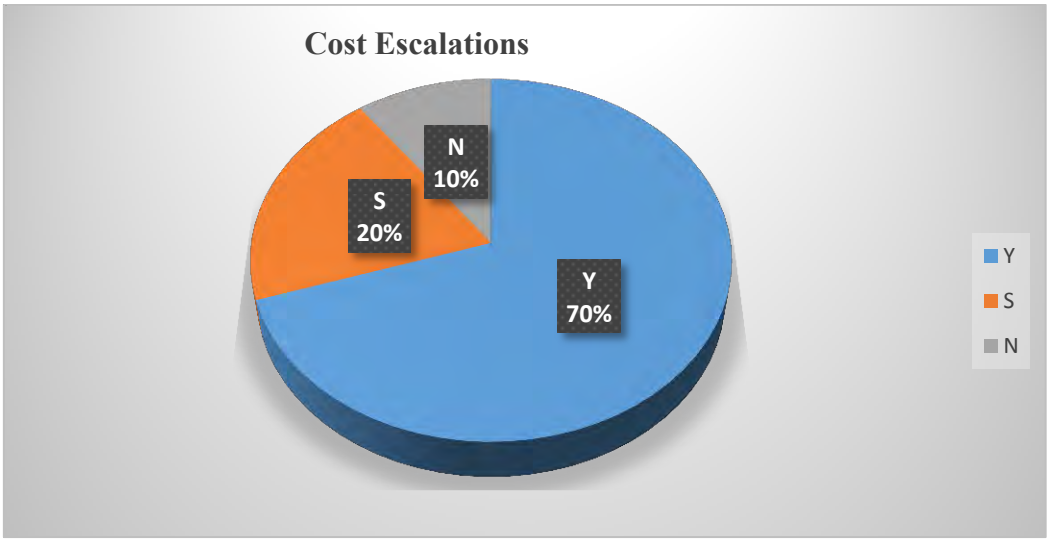

Fig.4.2.6 Cost escalation avoidance

Figure 4.2.6 shows the responses relating to respondents who believe that cost escalations in project execution can be avoided during turnarounds. The results indicated that only 70% of the respondents agreed that cost escalation can be avoided and 10% disagreed and 20% are uncertain.

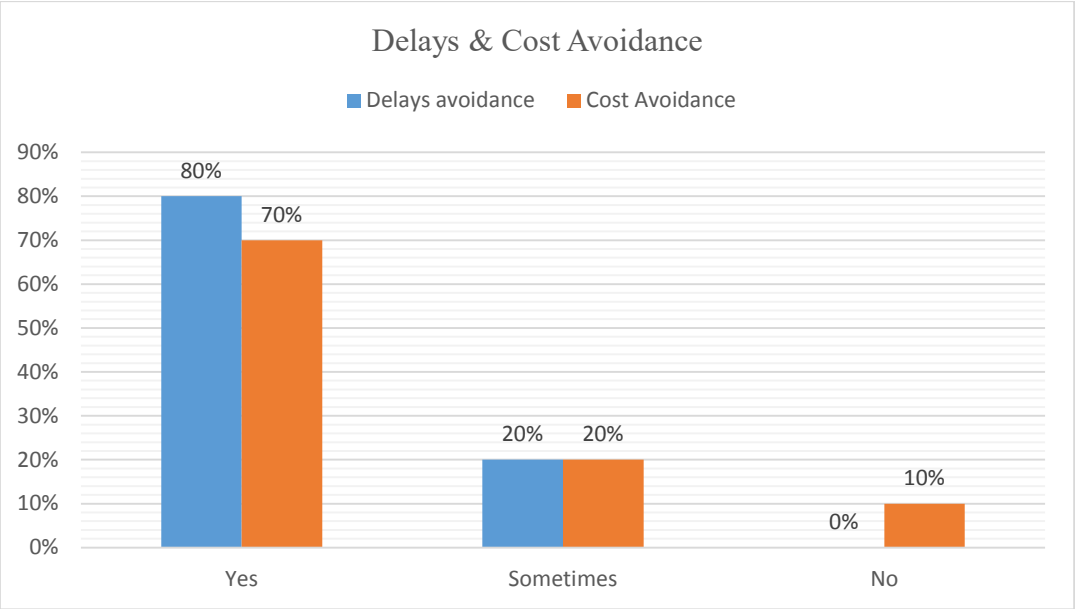

Fig.4.2.7 Delays and cost avoidance

Figure 4.2.7 shows responses of respondents on the issues of delays and cost escalations avoidance during the project execution in turnarounds.

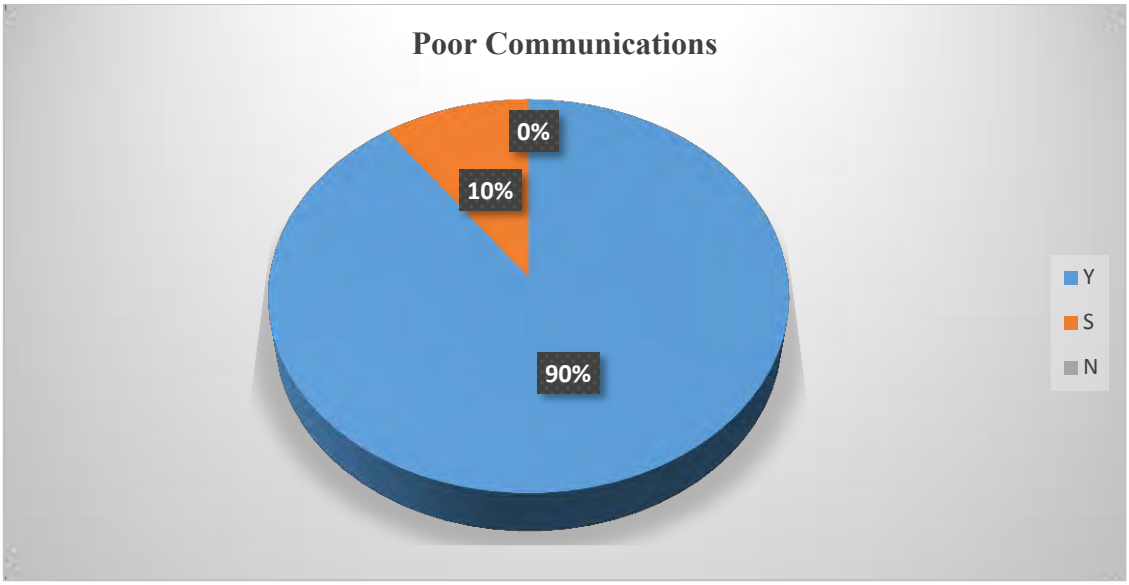

Fig 4.2.8 Poor communications results

Figure 4.2.8 shows the results of the question on the contribution of poor communication to the causes of delays. The results indicated that 90% of the respondents agreed that poor communication results in project delays and only 10% are uncertain.

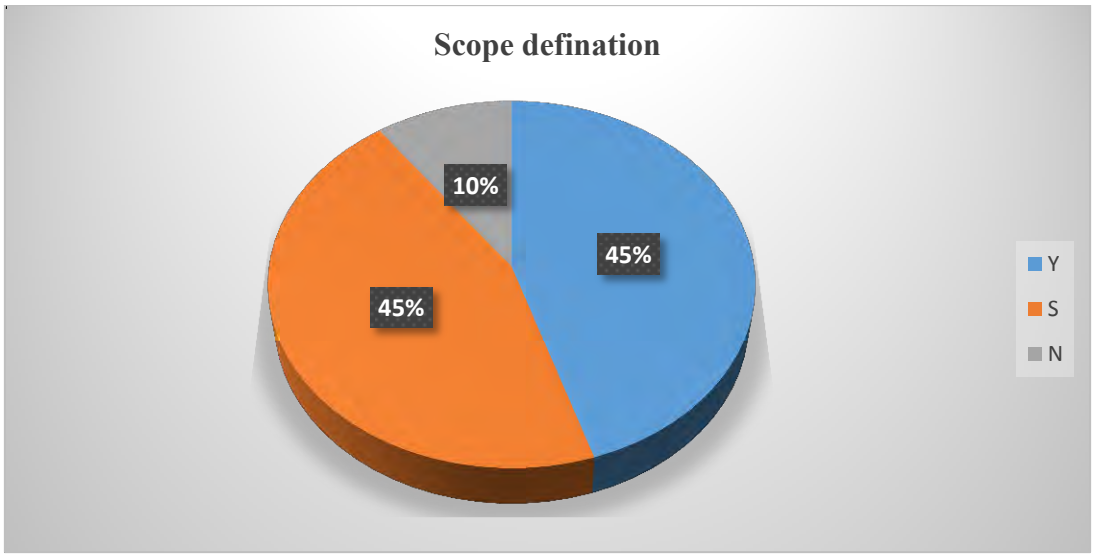

Fig. 4.2.9 Scope definition results

Figure 4.2.9 shows the results on the question of the contribution of scope definition to the causes of delays in project execution. The results indicated that 45% of the respondents are agreeing that project scope is clearly defined and 45% are uncertain, only 10% are saying scope is not clearly defined.

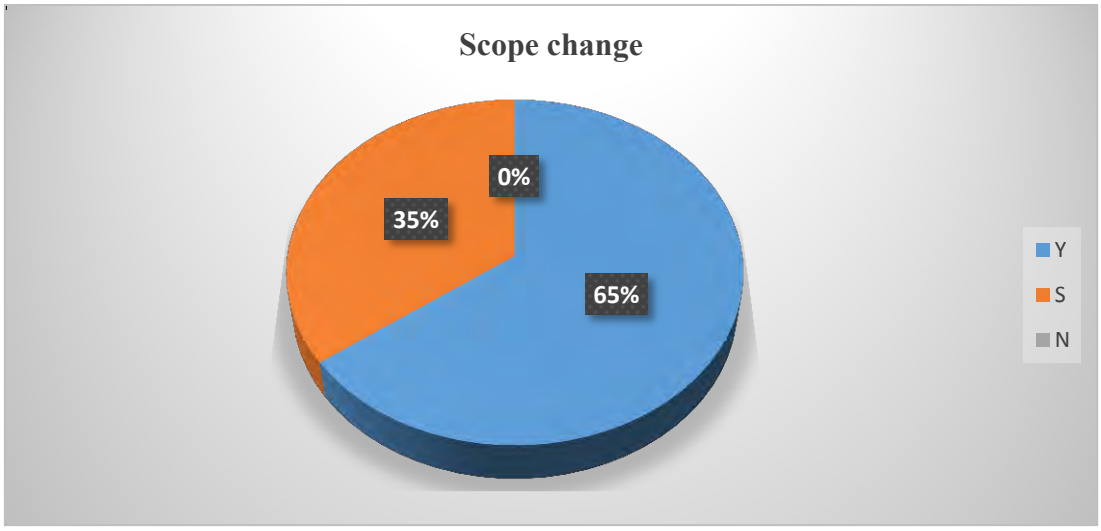

Fig. 4.2.10 Scope change results

Figure 4.2.10 shows the results on the question of the contribution of scope change to the causes of delays in project execution. The results indicate that 65% of the respondents are agreeing that there is always a scope change during execution and 35% saying sometimes it happens.

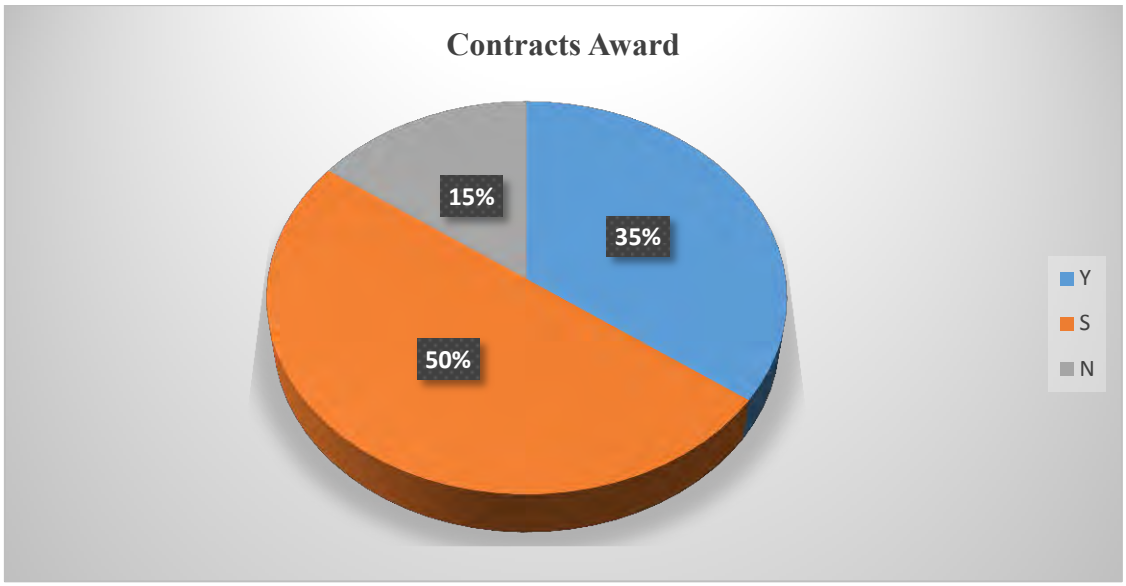

Fig. 4.2.11 Contract award

Figure 4.2.11 shows the results of the question on the contribution of contract awarding to the causes of delays in project execution. This results indicate that 15% of the respondents disagree that contracts are awarded on time and 50% are saying sometimes and only 35% agrees to the award of contract on time.

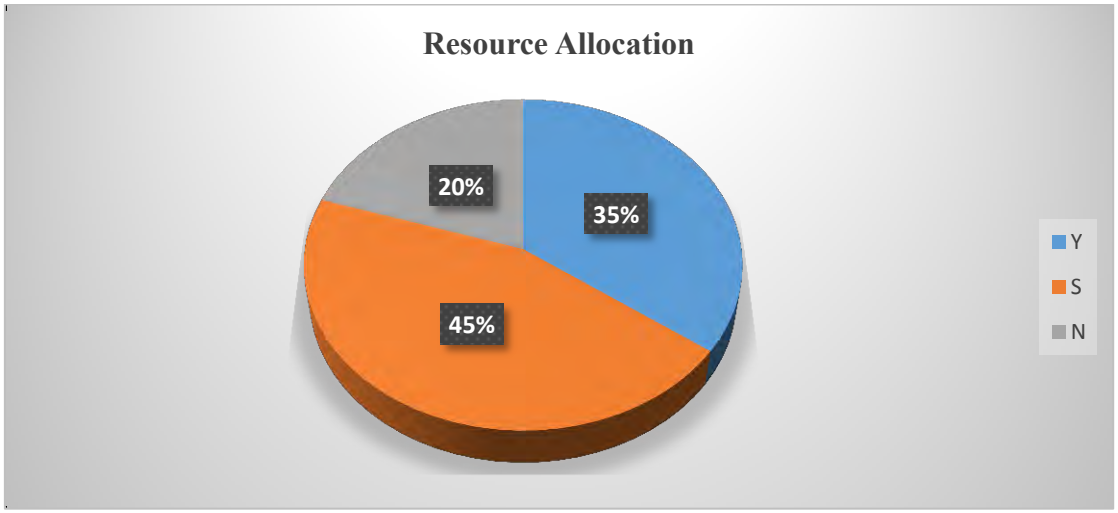

Fig. 4.2.12 Resource Allocation

Figure 4.2.12 shows the results of the question on the contribution of resource allocation to the causes of delays in project execution. The results indicated that 35% agreed to the adequate resource allocation to the project and 45% are saying sometimes and only 20% disagree.

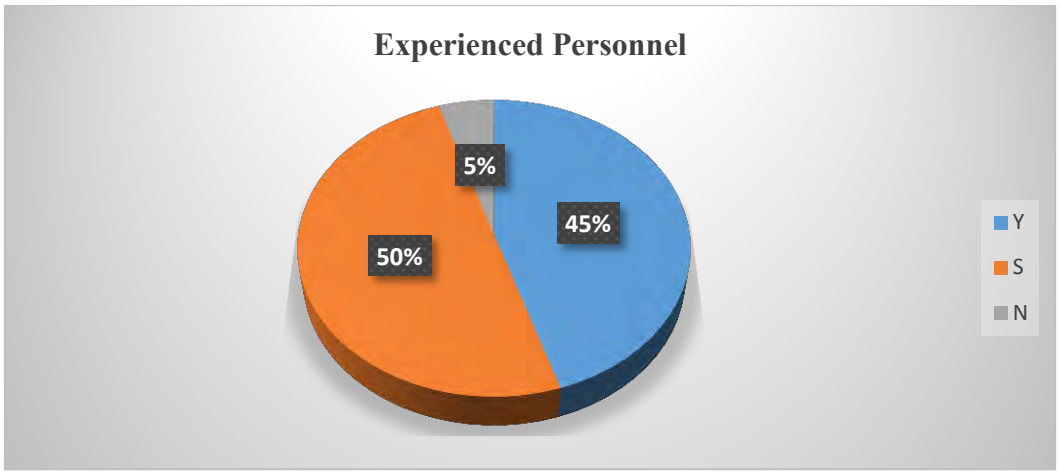

Fig.4.2.13 Experienced personnel

Figure 4.2.13 shows the results on the question of experienced personnel involved in the project execution, and their contribution to the causes of delays in project execution. The results showed that only 45% agreed that work is executed by experienced personnel, 5% disagreed and 50% are saying sometimes.

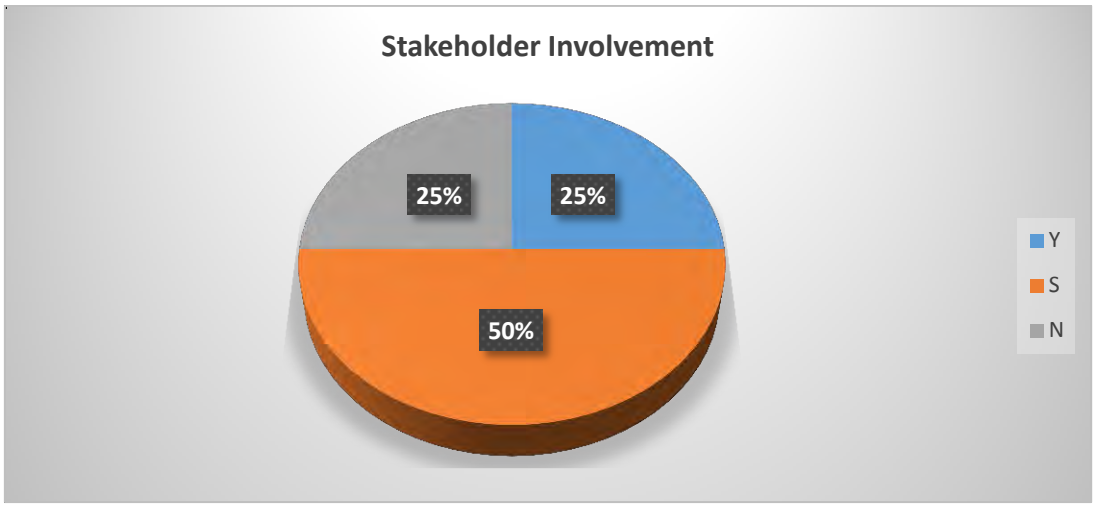

Fig.4.2.14 Stakeholder involvement

Figure 4.2.14 shows the results of the question on the contribution of stakeholder involvement to the causes of delays in project execution. The results indicated that 25% agreed that all stakeholder are involved in the panning process, 25% disagreed and 50% are saying sometimes.

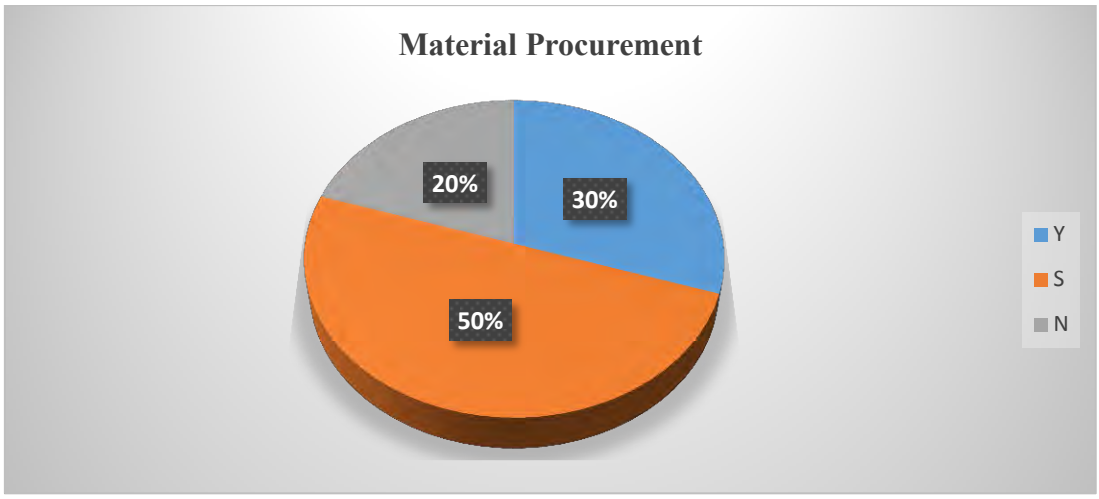

Fig. 4.2.15 Material procurement

Figure 4.2.15 shows the results of the question on the contribution of procurement of materials to the causes of delays in project execution. The results indicated that 30% of the respondents agreed that material is procured on time, 50% says sometimes and only 20% disagreed.

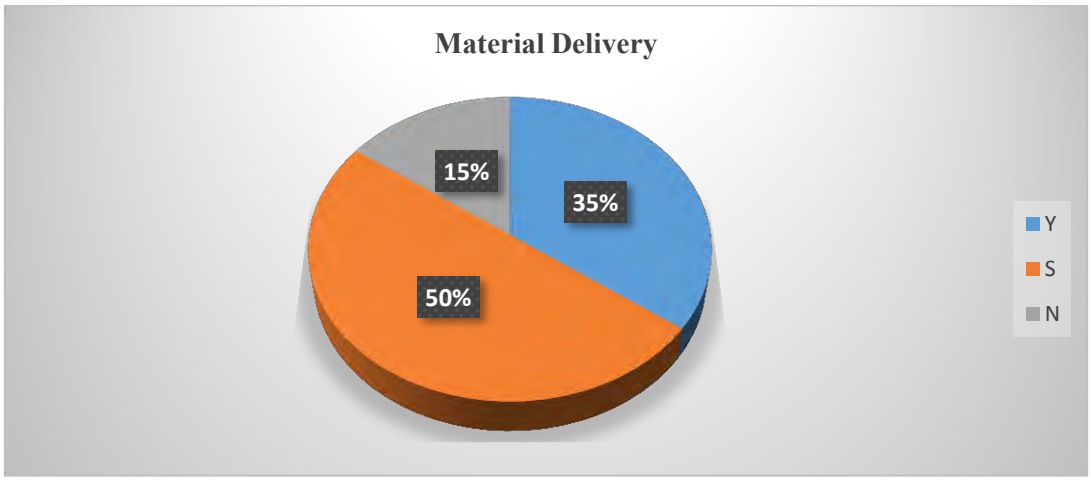

Fig. 4.2.16 Material delivery

Figure 4.2.16 shows the results of question on the contribution of the delivery of materials to the causes of delays in project execution. The results indicated that 35% agreed that material is delivered on time, 50% say sometimes and only 15% disagreed.

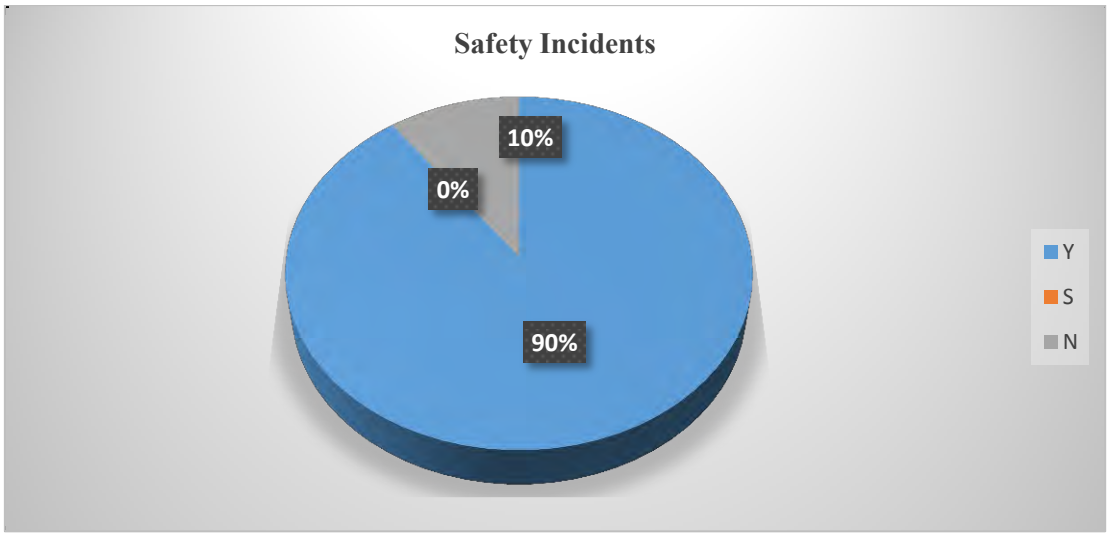

Fig. 4.2.17 Safety incidents

Figure 4.2.17 shows the results the question on the contribution of safety incidents to the causes of delays in project execution. The results indicated that 90% agreed that there are safety incidents during project execution and 10% disagreed.

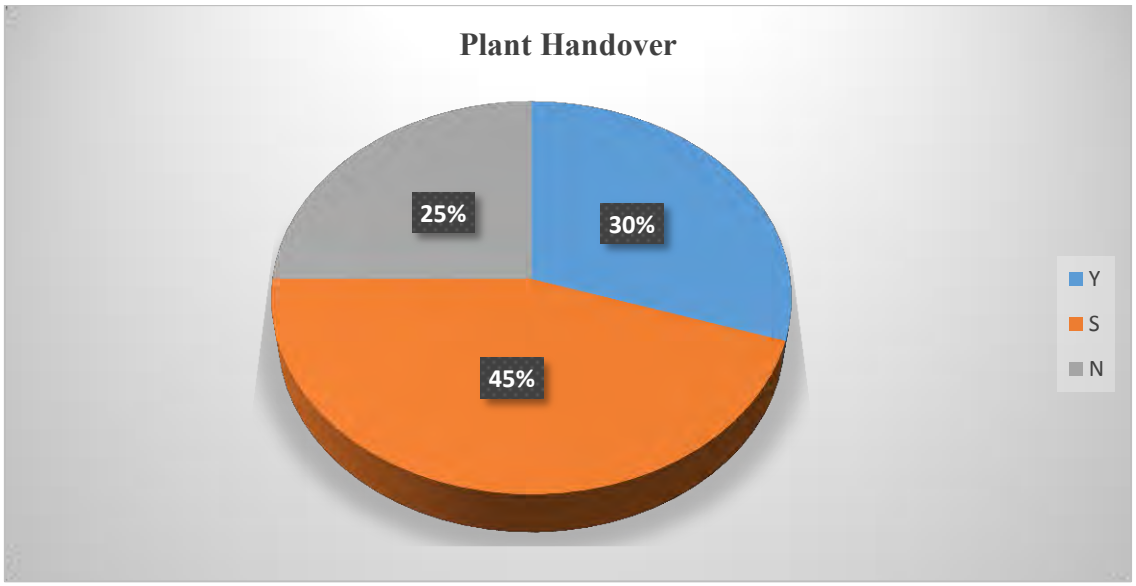

Fig.4.2.18 Plant handover

Figure 4.2.18 shows the results the question on the contribution of plant handover to the executing team to the causes of delays in project execution. The results indicated that 30% agreed that the plant is handed over on time to the executing team, and 25% disagreed and the 45% are saying sometimes.

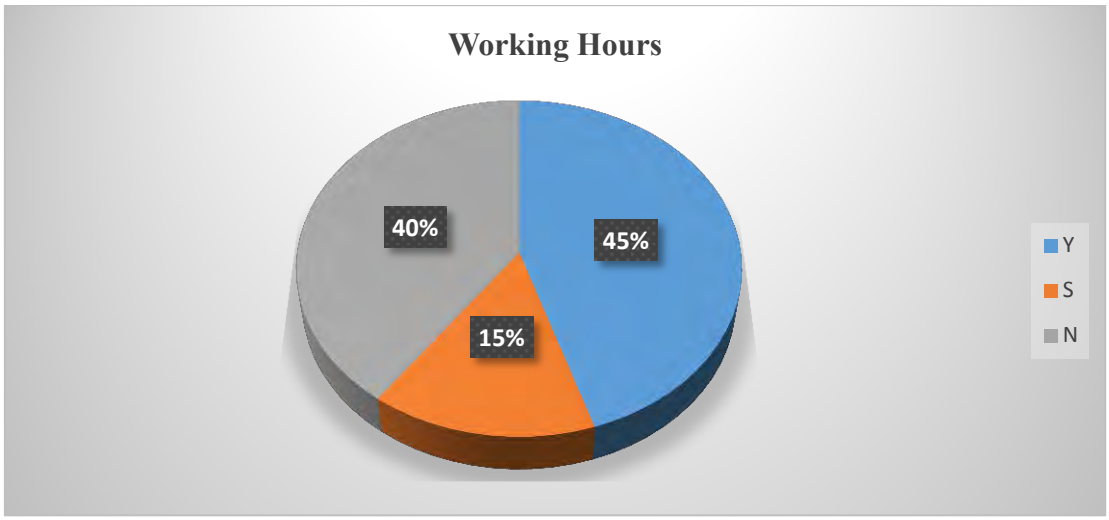

Fig.4.2.19 Working hours

Figure 4.2.19 shows the results of the question on the contribution of working hours during execution to the causes of delays in project execution. The results indicated that 45% agreed that the working hours are too long, 40% disagreed and 15% are uncertain.

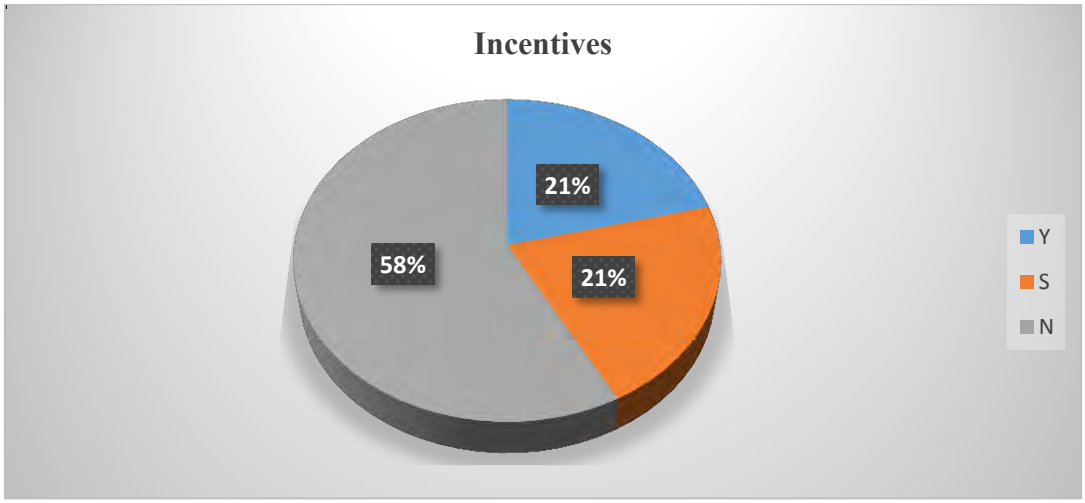

Fig. 4.2.20 Incentives for job well done

Figure 4.2.20 shows the results of the question on the contribution of incentives for the job well done to the causes of delays in project execution. The results indicated that 21% agreed that there are incentives for a job well done, another 21% are saying that happens sometimes and 58% disagreed.

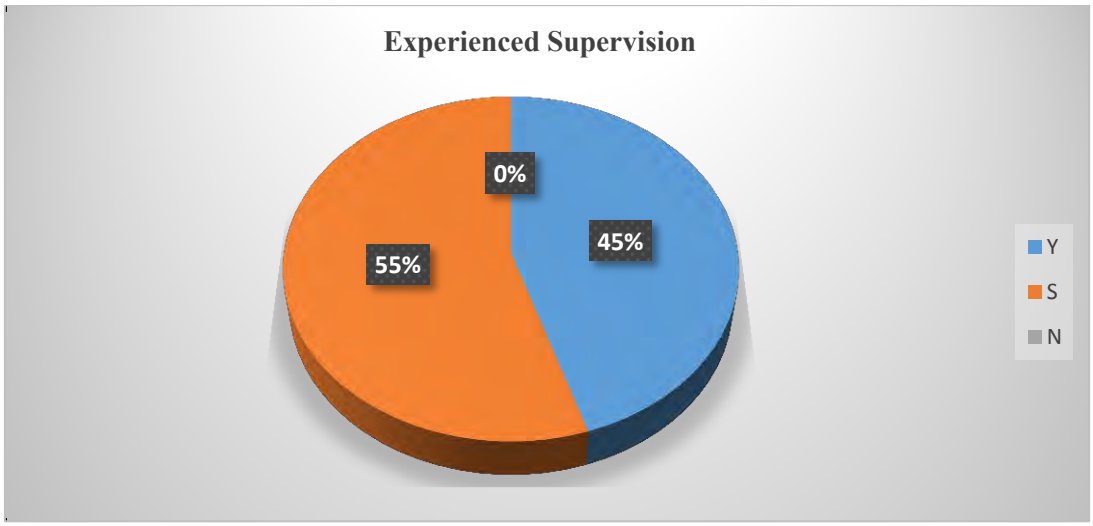

Fig. 4.2.21 Experienced supervision

Figure 4.2.21 shows the results of the question on the contribution of experienced supervision available or involved to the causes of cost escalation in project execution. The results indicated that 45% agreed that project supervisors are experienced, and 55% says that happened sometimes.

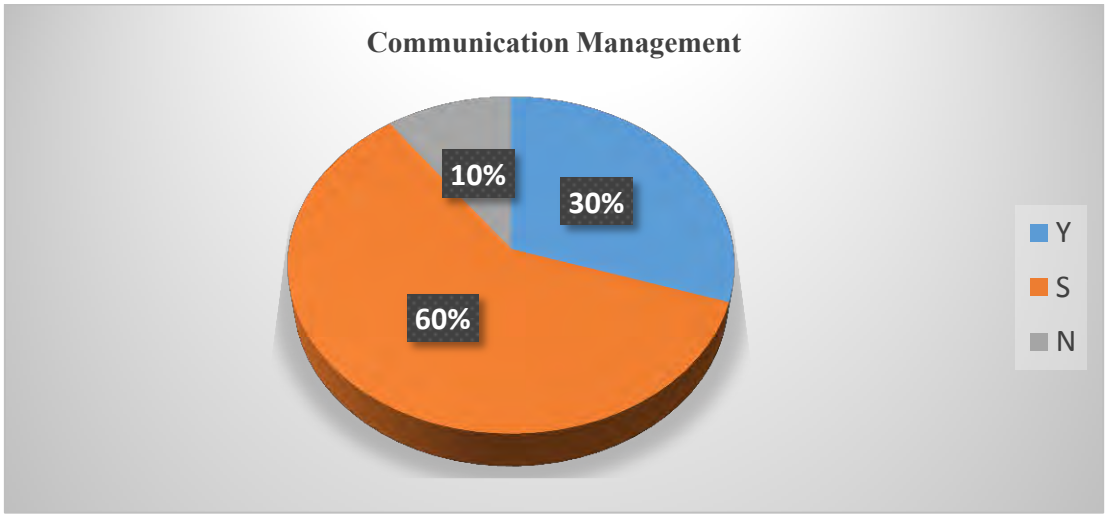

Fig.4.2.22 Communication management

Figure 4.2.22 shows the results of the question on the contribution of communication management to the causes of delays and cost escalation in project execution. The results indicated that only 30% agreed that communication is managed correctly, 60% says sometimes and 10% disagree.

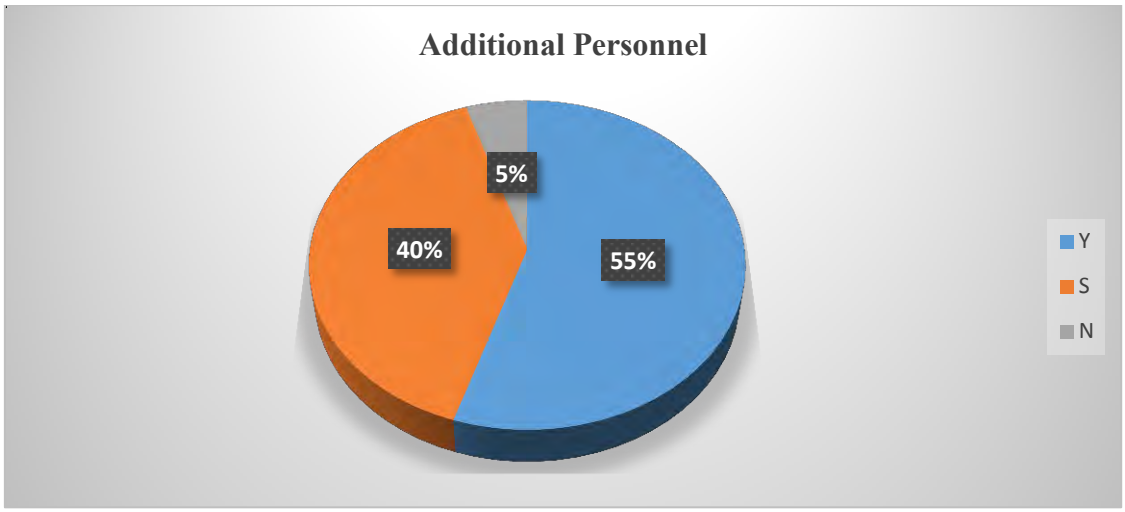

Fig. 4.2.23 Personnel addition

Figure 4.2.23 a shows the results the question on the contribution of adding personnel to meet deadlines to the causes of cost escalation in project execution. The results indicated that 55% agreed to project crashing and 40% said sometimes and only 5% disagree.

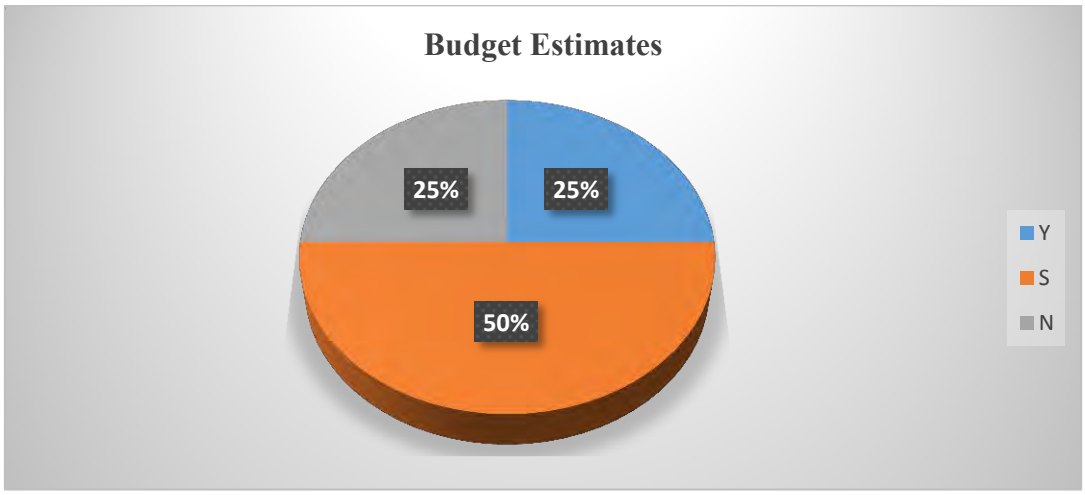

Fig. 4.2.24 Budget estimates

Figure 4.2.24 shows the results the question on the contribution of budget estimates c to the causes of cost escalation in project execution. The results indicated that 25% agreed that budget estimates are done correctly, 25% disagreed and 50% said sometimes.

Fig. 4.2.25 Quality control management

Figure 4.2.25 shows the results of the question on the contribution of quality control management to the causes of cost escalation in project execution. The results indicated that 35% agreed that quality control is managed by qualified quality controllers, 15% disagree and 50% said sometimes.

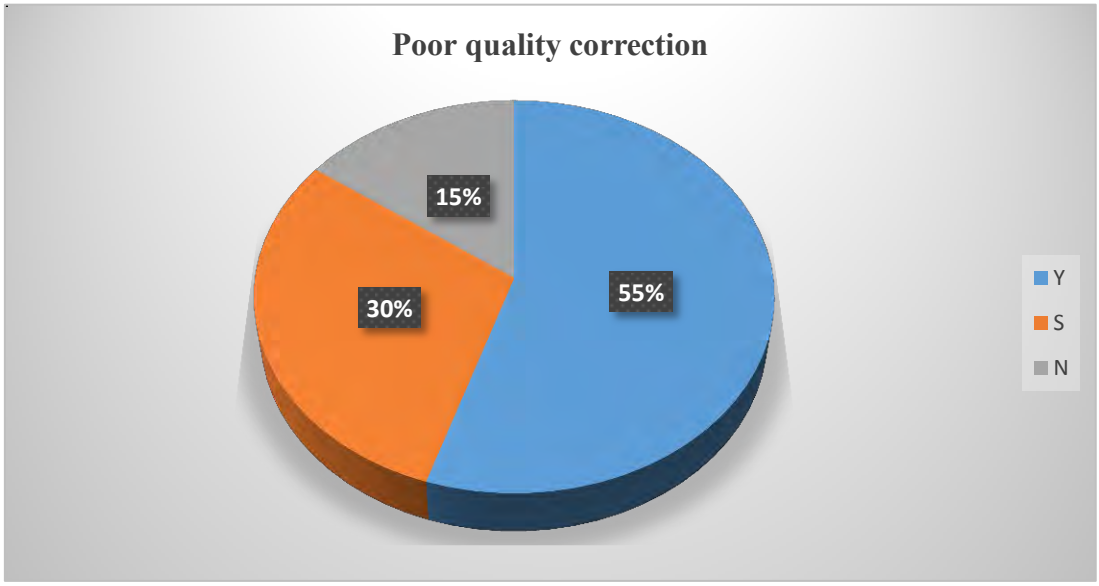

Fig. 4.2.26 Poor quality corrections

Figure 4.2.26 shows the results of the question on the contribution of poor quality corrections to the causes of cost escalation in project execution. The results indicated that 55% agreed that actions are taken to prevent poor quality from occurring again, 30% said sometimes and 15% disagreed.

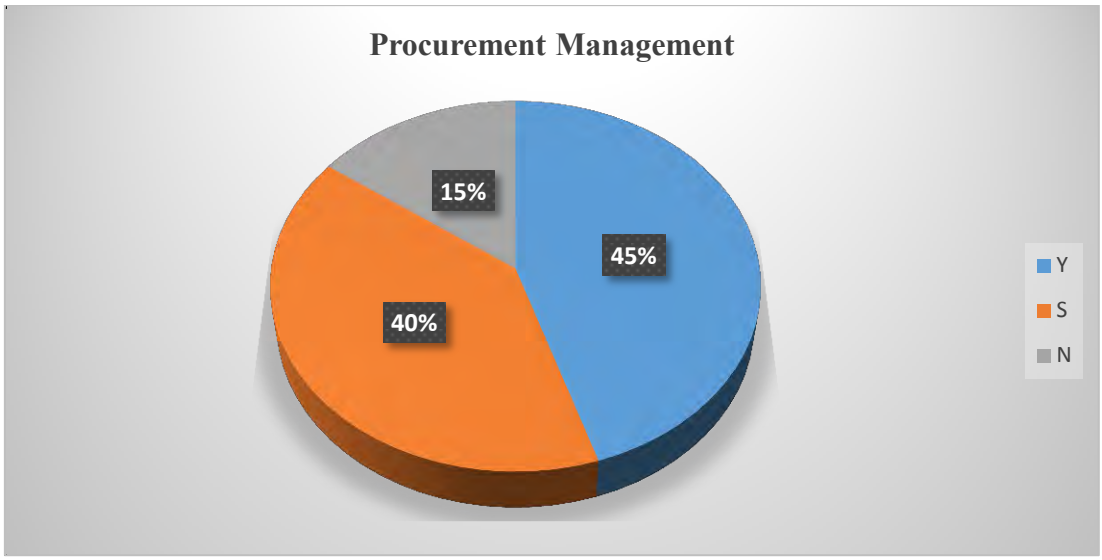

Fig. 4.2.27 Procurement management

Figure 4.2.27 shows the results of the question on the contribution of procurement management to the causes of cost escalation in project execution. The results showed that 45% agreed that procurement is managed by a procurement manager, 40% said sometimes and 15% disagreed.

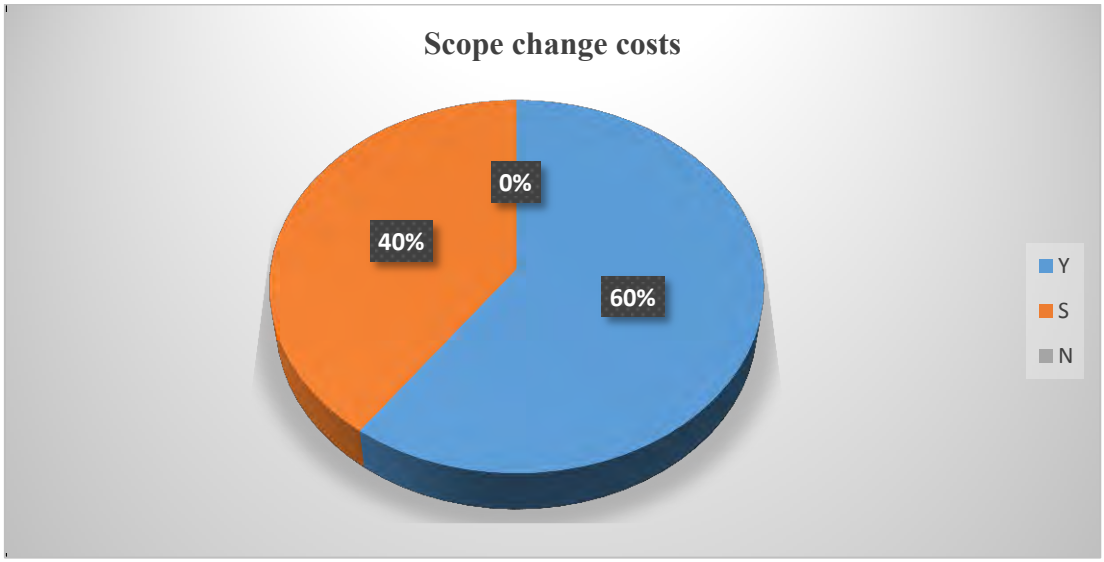

Fig. 4.2.28 Scope change cost

Figure 4.2.28 shows the results of the question on the contribution of scope change to the causes of cost escalation in project execution. These results indicated that 60% of the respondents agreed that scope change results in cost escalation, and only 40% are saying sometimes and no one disagrees.

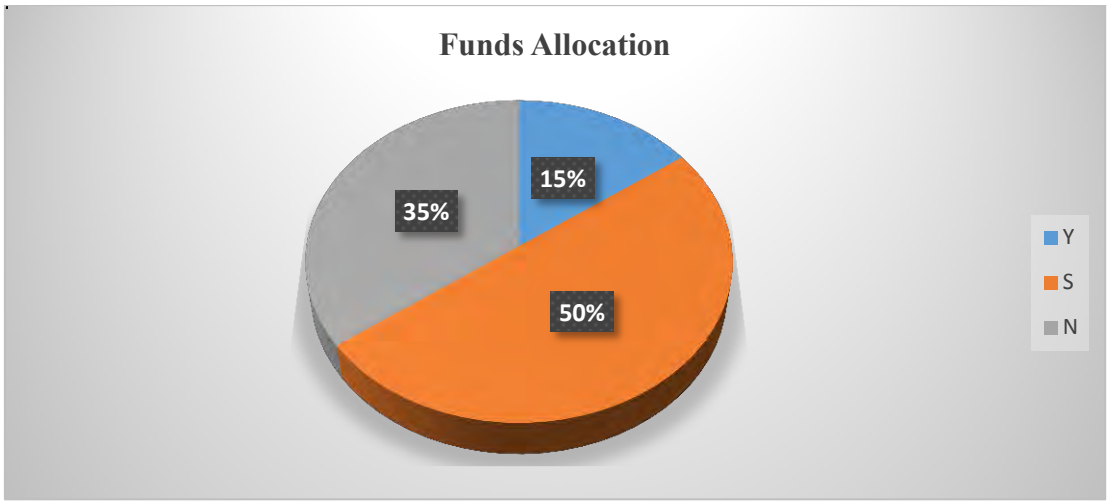

Fig. 4.2.29 Funds allocation

Figure 4.2.29 shows the results of the question on the contribution of funds allocation c to the causes of cost escalation in project execution. The results showed that 15% agreed that funds allocation to projects is adequate, 50% said sometimes and 35% disagreed.

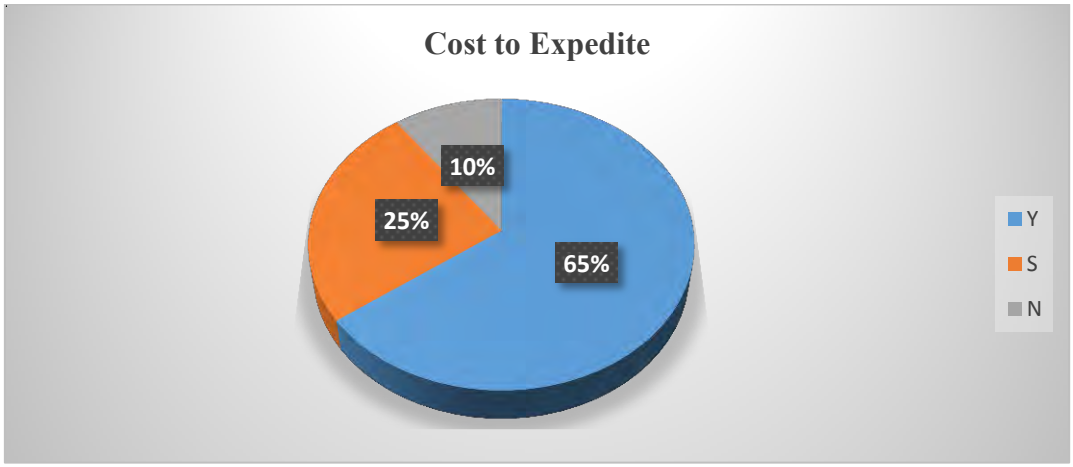

Fig. 4.2.30 Acceleration cost

Figure 4.2.30 shows the results of the question on the contribution of acceleration payments to the causes of cost escalation in project execution. The results indicated that 65% of the respondents agreed that more is paid to expedite material delivery, 25% said sometimes and 10% disagreed.

4.3 Conclusion

The data collected from respondents through questionnaires were presented in this chapter, in tables and figures for analysis. The results in each figure is presented and explained. The next chapter will analyse the responses in detail, in order to establish the causes of delays and cost escalations experienced in project execution during turnarounds.

CHAPTER FIVE

Discussions

5.1 Introduction

In this chapter the data presented in chapter four are analysed and discussed in terms of each survey question put to the respondents and their responses. Discussions are based on the results obtained from the respondents' answers, to determine if there was agreement or disagreement on the respective statements presented in the questionnaire, in an attempt to achieve the objectives of this study.

5.2 Discussions

5.2.1 Delays in Project Execution

The respondents agreed with the statement that delays during turnarounds could be avoided. This is a positive sign suggesting that personnel involved in executing projects during turnarounds still maintain positive thinking and believe that things can be done differently to avoid these delays. The results show that 80% of the respondents agreed that delays can be avoided whereas 20% were unsure. This signal that these delays are controllable and that proper planning could add positive results.

The results also show that respondents were in agreement with the statement that poor communication results in project delays. Communication is a key element in any endeavour seeking to achieve common objectives. Improvement in communication could yield positive outcomes.

According to (PMBOK, 2013), without communication nothing will work out, and it should be managed according to the agreed commutation management plan, to avoid confusions, conflicts and delays.

Respondents agreed that the project scope was clearly defined but also agreed that, in spite of a clearly defined scope, changes in scope happen during execution. These statements seem to contradict each other. The question it raises is what causes a scope change during execution, if the scope was clearly defined in the beginning.

According to (Ertl, 2014), scope change during execution might be inevitable. Therefore a scope management process should be implemented, through the approval channels. A change in scope will affect the project planning, budget, resources, materials and schedule. According to (Larson & Larson, 2009), scope creep in a project results in time wastage, money wastage, and diminished satisfaction.

Respondents agreed that the working hours were not too long, but also agreed that safety incidents happen during turnarounds. The main question that needs to be answered is what causes these safety incidents. According to (Tse & Love, 2003), excessive amount of overtime may contribute to losses in productivity and reduced quality.

There was no consensus among respondents that all stakeholders are involved in the planning process. The involvement of stakeholders improves project execution, as the project manager will know who are involved and what their respective key roles are. This will assist in identifying key areas which may affect and be affected by executing the project. It will also provide assistance in managing the associated risks and reduce conflicts that may cause delays. According to (Doloi, 2013), key stakeholders are key to the success of the project.

Survey results showed that few respondents are of the opinion that the plant was handed over to the executing team on time. Delays in handing over the plant to the executing team automatically pose a delay risk, therefore delays become unavoidable unless crashing is applied, which comes at a cost.

Supervision is one of the most important elements in driving the schedule. The majority of respondents agreed that the project supervisors used during the turnarounds to were experienced. This could minimise project delays in the executing of projects in the refinery.

Communication management was apparently not managed correctly during turnarounds. This might be due to a poor communication plan or inadequate methods of communication. Poor communication management breed confusion, and delays will be imminent. This is witnessed by the disagreement in the responses of the survey participants.

When a job well done is rewarded, the level of motivation increases. However, the survey results indicated that there is disagreement with regard to incentivising jobs well done. Unmotivated teams may be an underlying cause of delays in project execution. While there is disagreement on this matter among respondents, some still felt that there are incentives. This raises the question as to what criteria are used to incentivise a job well done.

5.2.2 Cost escalation

Respondents disagreed regarding awarding contracts on time. If contracts are not awarded on time, the probability of delay increases. Contractors and vendors cannot start any preparations unless they have a contract in place. By the time the contract is awarded, it is too late. So delays occur even before the project is commenced. The time given to execute the project is already not realistic as argued in (Cameron, 2014), and in (Budd & Budd, 2003).

The disagreement on material procurement and material delivery are directly linked to the awarding of contracts. The disagreement on the procurement plan being managed by the procurement manager adds another factor to the procurement process that might contribute to these delays.

Regarding resource allocation few respondents believed that resources were allocated adequately to the project. Without adequate resources, it is unlikely that a project would be executed successfully. However, respondents agreed that the personnel involved in the executing of projects were experienced. The main question that needs to be answered is whether the personnel involved formed part of the resource allocation team? According to (PMBOK, 2013), resource allocation is critical for project success.

There was substantial disagreement with regard to quality control management during execution. Most respondents thought that quality control was not managed by qualified personnel, which would definitely lead to poor quality management. If quality is compromised there is a greater chance for re-work, and re-work will cause delays and increase cost escalations (PMBOK, 2013). There was however agreement that action was taken against poor quality to avoid repetitions. The concern will be in the application of the lesson learnt for future turnaround projects.

Respondents disagreed with regard to procurement management. As a result material was not procured on time and consequently deliveries were late, as witnessed by the disagreements of the respondents. Materials were not delivered on time and respondents agreed that more was paid to expedite delivery of materials. This escalated the cost of the project. The procurement plan was not managed by the procurement manager.

There was also disagreement among respondents with regard to the preparation of the budgets estimates. Budget estimates is key to sufficient and appropriate budget for the project. If the estimates are not correct the funds allocations to the projects will be inadequate. Inaccurate funds allocation will deplete the budget before the project is finished. A further funds request will be regarded as cost escalation and the project will eventually cost more than budgeted for.

Respondents agreed that there was quality control during execution; however, they disagreed that the quality control was done by qualified personnel but agreed that some action was taken against poor quality work to avoid repetition.

The scope change during execution is a major contributor to project delays and cost escalation. When the scope changes almost everything else about the project will change. The schedule, budget, resource allocation and risks have to be reviewed to ensure that most of the things are still feasible to complete the project successfully. Respondents strongly agreed that there is always a scope change during project execution.

5.3 Conclusion

The data presented in chapter four was analysed in this chapter to establish the findings thereof. Analysis of the results endeavoured to establish the contributors to the delays and cost escalations in projects executed during turnarounds. The next chapter will outline the findings and recommendations in relation to the objectives of the study. Conclusions will be drawn based on the context of the chapter.

CHAPTER SIX

Recommendations and Conclusion

6.1 Introduction

In this chapter recommendations are made based on the discussions in chapter five, the findings will be tabled, and benefits of applying the recommendations will be highlighted at the end of the chapter. Conclusions will be drawn regarding the research study.

6.2 Findings

Findings from the study indicate that poor communication is a major contributor to delays and cost escalations in project execution during turnarounds at Engen Refinery. Safety incidents during turnarounds further lead to delays and consequently cost escalation. If a safety incident happens, the job needs to be stopped completely while an investigation is under way, until the main cause is established and corrective actions are put in place, to avoid another incident. The lesson learnt from the incident should be shared with the whole organization.

Although the scope is clearly defined, scope change does happen during execution and contributes to delays. Changes in scope inevitably result in review of the schedule, cost and plans, which takes time to adjust. Cost escalation can be avoided during project execution. Materials are not procured on time, which affects delivery time and consequently more is paid to expedite delivery.

There are always quality issues resulting from unqualified quality control inspectors; however, actions are taken to avoid repetition. There are experienced people executing projects during the shutdown.

The cost related to acceleration of materials delivery, communication, scope change and quality are major contributors to cost escalation, followed by inexperienced supervision and poor budget estimates.

6.3 Recommendations

6.3.1 Delays

It is very encouraging to see that most respondents believe that delays in project execution can be avoided. It is recommended that poor communication should be avoided as it has been found a major contributor to the causes of delays. Communications should be administered at all levels about the objectives of the projects to be executed.

Although scope definition does not seem to be a major problem, the scope definition should be improved to avoid any gaps which lead to scope change and result in conflicts. The research found that scope is changed mostly during execution and therefore it is recommended that the scope be fixed before execution. Scope should be defined by specialists in the field to avoid missing some important elements. This should minimise the need for scope changes during execution. Any foreseen changes should be budgeted for and have resources allocated to – they should be part of the recovery plan as discussed in chapter two.

It is recommended that contracts are placed on time as far as possible and any activities delaying contracts placement identified and attended to, as early as possible. This will allow contractors to prepare thoroughly. It is also recommended that the allocation of adequate resources should be improved.

The literature indicates that stakeholders are those people that affect or could be affected by the project. The research finding is that not all of them are involved at the beginning of the project. It is therefore recommended to involve all stakeholders at the beginning of the project. The quality control should also be improved. The purchasing of long lead materials should be improved, and consequently the delivery of those materials should improve.

Research findings further indicate that safety incidents occur most of the time during project execution. Focus should be directed to avoid the safety incidents as they cost money and reduce allocated resources. The plant handover for execution has been found as another obstacle that delays the starting time. This is a tricky issue as plant would not be handed over for execution unless they are made safe. Proper planning however could improve the situation.

The working hours are believed to be adequate; however people should be encouraged to rest during the rest days, which is difficult to manage. Most respondents said that there are no incentives for jobs well done. It is recommended that incentives be introduced for jobs well done to encourage work excellence and quality. However, transparent criteria should be agreed upon in advance to avoid conflict and discouragement of teams that think they deserve the incentives, when they are not and not incentivising those who are deserving.

6.3.2 Costs

It is very encouraging that most respondents felt that cost escalations can be avoided during project execution in turnarounds at Engen Refinery. It is therefore recommended that communication should be improved during turnarounds so that every individual is up to date with all developments.

Resource planning should be improved to avoid adding resources in the middle of the project execution as those resources come at a cost that is not budgeted for. The budget estimates should be improved as well; research findings indicate that budgeting is not done correctly. Budget estimate software should be purchased and used by the organization in order to avoid cost escalation resulting from incorrect budgets.

Quality controls should be improved during project execution. The procurement processes should be improved. The scope change during project execution should be avoided at all cost. The scope should be fixed before execution commences, and any scope change should be approved and monitored closely by the project managers, supervisors and engineers.

The allocation of funds is linked to the budget estimates. If estimates are not done correctly, chances are that fund allocation will be inadequate. Adequate allocation of funds will avoid going back to the investment committee to ask for additional funding during execution as that is regarded as cost escalation.

It is further recommended that a study should be carried out in the future to establish methods that could be used to improve the gaps identified in the elements that contribute to these delays and cost escalations.

6.4 Recommendation for future Study

The current study was carried out at Engen refinery and the focus were directed to delays and cost escalation in executing projects during Turnarounds. Delays and cost escalations also affects projects that are executed outside Turnarounds. It is therefore recommended that future studies should focus on delays in project execution with Engen refinery as a whole. The findings can be integrated into the Project Management System of the organisation.

6.5 Conclusion

Recommendations were made in this chapter based on the findings from the research. The implementation of these recommendations is sought to bring improvement in the way in which Engen execute projects during turnarounds in the refinery.

Adoption of these recommendations could close the gaps that lead to delays and cost escalations in project execution, thereby improving the ways projects are executed. Further studies are recommended to establish details in which the gaps could be improved and further closed out.

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APPENDICES

1. Consent form

UNIVERSITY OF KWAZULU-NATAL
GRADUATE SCHOOL OF BUSINESS AND LEADERSHIP

Dear Respondent,

MBA Research Project

Researcher : Mfanimpela Z Mhlanga – 0822698226; mhlangaz@gmail.com

Supervisor : Dr. E. Munapo – 031 260 8943; munapoe@ukzn.ac.za

Research Office : Ms P Ximba 031-2603587

: Mrs Zarina Bullyraj 031-260 1615; bullyraj@ukzn.ac.za

I, **Mfanimpela Zacharia Mhlanga** an MBA student, at the Graduate School of Business and Leadership, of the University of Kwa Zulu Natal. You are invited to participate in a research project entitled: **Investigating causes of delays and cost escalations in Project execution during Turnarounds.** The aim of this study is to:

- To gain understanding of the underlying issues that cause delays, and their root causes;
- To outline the challenges that result in the delays and cost escalations;
- To analyze possible solutions that may remedy the delays and avoid cost escalation issues during the shutdowns; and
- To make recommendations for corrective or preventative actions to avoid further delays and cost escalations, to the benefits of the refinery

. Through your participation I hope to understand

- Why there are delays in project executions during Turnarounds?
- What causes costs escalations?
- How t delays and cost escalations could be avoided?

The results of the focus group are intended to contribute to the **implementation of delays preventions and cost escalation techniques.**

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

If you have any questions or concerns about completing the questionnaire or about participating in this study, you may contact me or my supervisor at the numbers listed above.
The survey should take you about 5 minutes to complete. I hope you will take the time to complete this survey.

Sincerely

Investigator's Signature_____
Date_____

UNIVERSITY OF KWAZULU-NATAL
GRADUATE SCHOOL OF BUSINESS AND LEADERSHIP

MBA Research Project
Researcher: Mfanimpela Z Mhlanga – 0822698226; mhlangaz@gmail.com
Supervisor: Dr. E. Munapo – 031 260 8943; munapoe@ukzn.ac.za
Research Office: Ms P Ximba 031-2603587
: Mrs Zarina Bullyraj 031-260 1615; bullyraj@ukzn.ac.za

CONSENT

I……(full names of participant) hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to participating in the research project.
I understand that I am at liberty to withdraw from the project at any time, should I so desire.

SIGNATURE OF PARTICIPANT DATE

……

2. Questionnaires

Questionnaire: *Please tick/cross/circle one*

Item	Questions	Responses		
1	**CAN DELAYS DURING TURNAROUNDS BE AVOIDED?**	**Yes**	**Sometimes**	**No**
2	Can Communication result in a project delay?	Yes	Sometimes	No
3	Are project scopes clearly defined?	Yes	Sometimes	No
4	Any scope change during execution?	Yes	Sometimes	No
5	Are contracts getting awarded on time?	Yes	Sometimes	No
6	Are resources get allocated adequately?	Yes	Sometimes	No
7	Is project execution done by experienced personnel?	Yes	Sometimes	No
8	Are all stakeholders involved in the planning process?	Yes	Sometimes	No
9	Is there quality control during project execution?	Yes	Sometimes	No
10	Are materials procured on time?	Yes	Sometimes	No
11	Are materials delivered on time?	Yes	Sometimes	No
12	Are there any safety incidents during execution?	Yes	Sometimes	No
13	Are the plants handed over on time to the executing team?	Yes	Sometimes	No
14	Are the working hours too much during turnaround?	Yes	Sometimes	No
15	Are there any incentives for job well done?	Yes	Sometimes	No
16	**CAN COST ESCALATION DURING TURNAROUNDS BE AVOIDED?**	**Yes**	**Sometimes**	**No**
17	Are the project supervisors experienced?	Yes	Sometimes	No
18	Is communication managed correctly during turnaround?	Yes	Sometimes	No
19	Do more people get added to the job during execution, to speed up the job?	Yes	Sometimes	No
20	Are the budget estimates done correctly?	Yes	Sometimes	No
21	Is quality control managed by qualified personnel?	Yes	Sometimes	No
22	Are actions taken for poor quality work?	Yes	Sometimes	No
23	Is the procurement plan managed by procurement manager?	Yes	Sometimes	No
24	Is there any scope change during execution?	Yes	Sometimes	No
25	Are funds allocation adequate?	Yes	Sometimes	No
26	If materials not delivered on time do you pay more to expedite?	Yes	Sometimes	No

3. Ethical certificate

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

28 April 2015

Mr Mfanimpela Zacharia Mhlanga (961102828)
Graduate School of Business & Leadership
Westville Campus

Dear Mr Mhlanga,

Protocol reference number: HSS/0371/015M
Project title: Investigating causes of delays and cost escalations in project execution during Turnarounds

Full Approval – Expedited Application

With regards to your application received on 23 April 2015. The documents submitted have been accepted by the Humanities & Social Sciences Research Ethics Committee and **FULL APPROVAL** for the protocol has been granted.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number.

Please note: Research data should be securely stored in the discipline/department for a period of 5 years.

The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

.....
Dr Shenuka Singh (Chair)

/ms

Cc Supervisor: Dr Elias Munapo
Cc Academic Leader Research: Mr M Hoque
Cc School Administrator: Ms Zarina Bullyraj / Ms Gina Mshengu

Humanities & Social Sciences Research Ethics Committee
Dr Shenuka Singh (Chair)
Westville Campus, Govan Mbeki Building
Postal Address: Private Bag X54001, Durban 4000
Telephone: +27 (0) 31 260 3587/8350/4557 Facsimile: +27 (0) 31 260 4609 Email: ximbap@ukzn.ac.za / snymurm@ukzn.ac.za / mohunp@ukzn.ac.za
Website: www.ukzn.ac.za

4. Gatekeepers letter

To: University of KwaZulu-Natal

Graduate School of Business and Leadership

Re: Gatekeepers letter

This letter serves as a confirmation that *Mfanimpela Zacharia Mhlanga(961102828),* has been granted a permission to conduct a survey within the Refinery as part of his thesis for the MBA course.

Topic: *Investigation causes of delays and cost escalations in project execution during Turnarounds.*

The survey will be done at Engen Refinery on employees using questionnaire.

The permission is granted under these conditions:

1. Employee will voluntarily participate on the survey.
2. Data collected will be used for educational purpose only, and will only be shared by the Ukzn, Graduate School of Business and Leadership, and Engen Refinery.
3. Engen Refinery may request a copy of the report once completed.

Kind Regards,

Name	: Thabani Zondi
Designation	: Manager – Human Resource, Refinery
Contact number	: +2731 460 3306
Email address	: Thabani.Zondi@engenoil.com
Signature	:
Date	: 11 March 2015