KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF BUSINESS

AN EVALUATION OF PROJECT COST MANAGEMENT IN THE MINING INDUSTRY: A CASE STUDY OF ANGLOGOLD ASHANTI (GH) LIMITED – OBUASI MINE

BY

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DECLARATION

I declare that except for the references to other people's works, which have been duly acknowledged, this work is the result of my own efforts.

I hereby also declare that, this work has neither in whole nor in part been presented for an award of a degree elsewhere.

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ABSTRACT

Some businesses are by their exact peculiar nature riskier than others and therefore, investing in them is inherently riskier. Projects are means to achieving strategic objectives. To ensure projects meet such goals, there have to be controls, one of which is Project Cost Management. It is not minimizing cost but ensuring an optimum balance between costs, quality and time requirements. Project cost overruns may cause solvency issues and therefore the need to curtail such risks. Mining projects are usually large scale, complex, involve huge capital outlay and

needs to be completed on time. It is an incontestable fact that the capability to use veracious and tenacious project cost controls in the Ghanaian mining projects has inevitably raised concerns to the equity holders in mining sector. The resultant effect is the increased unsystematic risks associated with such mining endeavors. The study focused on the evaluation of project cost management in AGA with specific objectives being the assessment of project cost success criterion, project cost management processes examination and project cost variance investigation. With AngloGold Ashanti Obuasi mine halting its operations and fully entering into a limited operation phase, only a sample size of forty nine (49) personnel were available in the project and feasibility department. Questionnaires were administered to them with follow up interviews of some selected project sponsors. 316 projects from 2008 to 2015 were also evaluated. From the findings, a non-conformity to project cost management objectives and processes was established with 144 project cost overruns. The study recommends a strict adherence to project control mechanisms by project managers and suggests the award of fixed sum engineering, procurement, construction and management (EPCM) contracts with a co-integration of value engineering and alternate analysis from the owner's team.

DEDICATION

This research is dedicated to God almighty.

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I am grateful to the almighty God for his unfailing love, faithfulness, strength, knowledge and wisdom to undertake this study without which I would not have made it this far. I wish to express my profound appreciation to all who in diverse ways have contributed immensely to this research work. I also wish to thank my supervisor Mr. Kwasi Poku whose direction and aid made this study possible. Again I would like to express my sincere gratitude to my wife and my son, Mrs. Priscilla Tweneboah Osei and Kwadwo Nhyira Osei, for all their diverse support and encouragement; and to my god father, Mr. Afriyie Osei for your prayers, guidance and wise counsel towards my education and career development. Finally, I wish to thank all my colleagues, who aided in proof reading this paper. May the good God shower his bountiful blessings on all of you.

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CHAPTER ONE

INTRODUCTION

1.0 Introduction

This chapter presents the introduction, the background of the study, the research problem statement, objectives of the study, the research questions, relevance of the study, scope, methodology, limitation as well as the organization of the study.

1.1 Background of the study

"Of all those expensive and uncertain projects, however, which bring bankruptcy upon the greater part of the people who engage in them, there is none perhaps more perfectly ruinous than the search after new ... mines. ... Projects of mining, instead of replacing the capital employed in them ... commonly absorb both capital and profit." (Smith 1976 [1776], p. 562)

Mining may possibly have been the second of man's earliest endeavors, given that agriculture was the first. From prehistoric times to the present, mining has played an essential role in human existence and survival (Runge, 2010). Here the term mining is used in its broadest context as encompassing the extraction of any naturally occurring mineral substances - solid, liquid, and gas – from the earth or other heavenly bodies for utilitarian purposes. The most prominent that relates more to Ghana and is common, is gold mining.

The Obuasi Mine has been in production for more than 117 years. In the ten years to 2014 the mine produced over 3.4 million ounces of gold. Underground mining operations have now ceased on the basis of a continuous reduction in output and increase in operational and capital costs over the past 10 years. A Limited Operations Phase ("LOP") was instigated following approval by the Minister of Lands and Natural Resources in November 2014 to amend the program of Mining Operations.

The Obuasi mine site is quite extensive. It is in close proximity to Obuasi town, which has a population of around 200,000 people. The mine is an underground operation with a recent history of open pit mining. Numerous facilities, tailings storage, waste dumps, and exhausted open pits extend over 12 kilometres of the Ashanti Trend. Current operations focus on the southern section of the underground mine which comprises access shafts, support and waste disposal facilities, and the South Processing Plant ("SPP") which can treat up to 2.16 million tonnes of ore per year and includes a Bio-Oxidation ("BIOX®") Circuit to treat the refractory ore.

Despite the current operational challenges, the mine has a high quality orebody with Mineral Resources of 24.6 Moz of gold and Ore Reserves (Proven and Probable) of 5.26 Moz declared in accordance with the JORC Code (AusIMM, 2004). A Business Case has identified a Life of Mine plan with an annual production rate in excess of 500,000 oz of gold and a mine life of 16 years.

According to PwC's Mine publications capital project expenditure boomed between 2003 and 2008 with the world's most 40 largest mining companies' investing cash outflows increasing from $20 billion to $126 billion. While increased investment translated into increased production, by 2007, the mining industry was facing significant escalation pressures leading to some widely-publicized cost overruns and diminished returns on capital invested in these mining projects. Again, notwithstanding about $200 billion investment from 2007 to 2009, global mining production has remained flat across most commodities.

A project may be defined as a temporary organization to which resources are assigned to undertake a unique, novel and transient endeavor managing the inherent uncertainty and need for integration in order to deliver beneficial objectives of change (Turner & Müller, 2003, p. 7). Projects are means to achieving strategic objectives in an organization. The traditional

tenets of project control is to avoid scope creep, schedule slippage and cost overruns. Cost overruns exist in many facets of infrastructure and construction projects, shareholders do not often have knowledge of such overruns. Cost overruns increase the unsystematic risk associated with such ventures. Some industries are by their very nature riskier than others and therefore, investing in them is inherently riskier and as such these controllable risks must be curtailed. One of such unique industries is mining.

1.2 Problem Statement

It is a well-known that mining projects involve substantial investments, long period of time, sequential type of investment decisions and complex mosaic of numerous unknown factors that affect the value of the project (Stojanović & Borović, 2011). Carrying out major and complex projects within budget has become increasingly challenging and overwhelmingly problematic for most mining companies. In 2005, PricewaterhouseCoopers' global review of major mining projects revealed that only about 2.5% of such mining projects met the critical success criteria mainly cost, schedule and scope. Though, many mining firms have put in place controls to curtail these overruns, slippages and creeps, does such project cost management system work? In mining industry it is a normal problem that the actual cost of project exceeds the estimated cost of a project. Currently, the mining industry does not performed well in its capability to carry out projects according to the economic and corporate parameters forecast in the feasibility study process. For instance, the speed and measure of existing advances in Australia's mineral resources sector is worldwide known as unprecedented. A survey of eighteen mining projects covering period of 1965 to 1981 exposed an average cost overrun of 33 percent equated to their feasibility study estimates (Castle, 1985). A survey of sixty mining projects covering the period from 1980 to 2001 indicated average cost overruns of 22 percent with virtually half of the projects reporting overruns of an additional 20 percent (Gypton, 2002). A review of sixteen

mining projects carried out in the 1990s showed an average cost overrun of 25 percent, attributed to overly optimistic feasibility studies and poor cost estimation (Anon, 2000, as sited in Noort & Adams, 2006).

Therefore, a standard approach to mining project management, effective tools that can be utilized to meet the project objectives, and studies regarding risk factors associated with mining projects, are required to develop the current project management status of the mining industry. This problem needs proper planning, management and control on project to resolve it. Cost of project can be controlled by proper cost control system which utilizes a dynamic iteration of the project cost management processes. In recent past, players in the mining industry have encountered challenging operating environments and significant reduction in their net wealth. Investors have also expressed their frustrations with the lack of return as share prices have fallen and are applying increased pressure for greater cash return (Ernst & Young, 2013). Production at Obuasi has trended down since 1998, whilst costs and liabilities continued to rise. Many measures have been put in place over the years to address operational performance, however the rising gold price in the period 2000 to 2012 masked many of the operation's underlying issues, and denied the Company the real impetus to make the full suite of changes needed to turn around performance. In 2013 this unsustainable situation resulted in the lowest production since 1980. Combined with falls in the gold price that year from USD 1,650 /oz to USD 1,200 /oz, substantial operating losses combined with the realisation that there is still a significant amount of capital required to reposition the mine, forced management to change its operational strategy, or potentially face forced closure. With Obuasi mine in an LOP stage and preparations underway to fix the mine through the implementation of numerous projects, It is essential to conduct a study which seeks to evaluate project cost management challenges in the

mining industry in Ghana. There is little literature with regard to the project cost management in the mining and quarrying sector of developing economies.

The ability to implement the effective and efficient project cost management system in the Ghanaian mining industry is undoubtedly an enormous task to the mining sector. There is inadequate data in the industry to aid experts to make efficient and informed project cost management choices and strategies that will solve the ever re-occurring challenges. The issue of project cost management has attracted increasing attention of stakeholders in the mining industry in Ghana. This has created a general feeling of prejudice of mining companies and their operations in the country. In this stead, many companies in recent times have undertaken capital projects even at a time when the company's performance is on the decline for which AngloGold Ashanti is not an exception.

The present study thus, seeks to evaluate the project cost control system that had guided previous projects in AngloGold Ashanti Obuasi mine as to whether such controls were effective and curtailed avoidable cost overruns

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1.3 Objectives of the study

The main objective of the study is to evaluate the project cost management at AngloGold Ashanti – Obuasi mine. Specifically, the study seeks;

1. Assess whether projects in the mine are being managed to meet their major success criteria with regard to cost, schedule and quality.
2. Examine the project cost management process at the Obuasi mine.
3. Investigate the reasons for variance if any and alternative way to better manage cost of projects at the Obuasi mine.
4. Establish the challenges of project cost management at the Obuasi mine.

1.4 Research Questions

The study seeks to answer the following research questions:

1. Are projects cost objectives at AngloGold Ashanti Obuasi-mine being met?
2. What are the project cost management processes at the mine?
3. Where are the project cost variances arising from and alternative techniques for improvement?
4. What are the challenges of project cost management in the mine?

1.5 Scope of the Study

The company under study, AngloGold has been in existence for over hundred years. A lot of projects have been undertaken by the company in generally. The research will however concentrate on the evaluation of capital projects undertaken within the periods of 2010 – 2015 for convenience. Further, the research is limited in scope to the Obuasi-mine operations to the neglect of that in the Western region of Ghana as well as other mining firms in Ghana.

1.6 Significance of the study

The result of this study are expected to provide useful guidelines for establishing good project cost management practices in order to attract more investors to the mining industry. Furthermore, the same result can also be used as a baseline to compare the success of or impact of future improvement efforts in terms of stakeholders and investors preference of the management of project implementations and controls.

The study will reveal to the mining companies the inherent risks with improper cost controls and the intrinsic value of putting in place proper checks and balances for such risk in order to minimize to the barest minimum and also document the views of the investors on the project

cost management, to reveal mining companies what is required of them by their investors and stakeholders.

The work will again serve as a reference material for mining companies in making decisions concerning project cost management practices and strategies. The data from this study will serve as benchmark data for any further investigation, and as a useful material for academic purposes, and as an added literature to the existing knowledge.

1.7 Limitations of the study

The research was confronted with glitches such as:

- Inadequate time – The research study would have been a better representation of all mining firms in Ghana if many mining firms were used but due to the short duration allowed for the submission of this scholarly study only gold mining and for that, only the Obuasi mine site was used.
- Confidentiality Clause – where some management personnel have signed nondisclosure agreement as part of their employment contract not to make known confidential and high level information with regard to the company into the public domain notwithstanding the purposes for which it is being sought. To this regard, such personnel usually abstain from participating in scholarly and facts finding studies. The bureaucratic system and reluctance of some management personnel to reveal data was inevitable and a drawback to the study.
- Unresponsiveness on the part of respondents to some questions was a drawback to the research. Some of the personnel were reluctant to answer questions posed to them while others were basically not bothered providing information. This was particularly so in

the mines. They were usually not perturbed on the account that there was no direct impact on their livelihood.

1.8 Organization of the Study

This study was divided into five chapters. The first chapter covered the introduction, background of the study, statement of problem, objective, and justification of the study, scope, methodology, limitation and organization of the study. Chapter two dealt with a review of previous works or literature relevant to the topic whilst chapter three dealt with the study methodology. The fourth chapter essentially draws the empirical results of the survey findings, discussed and interpreted it whilst the fifth chapter concluded the study with summary of findings, conclusion and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter seeks to review previous works relating to project cost management, particularly in the mining industry. The literature review will cover both theoretical and empirical literature. The theoretical review will focus on existing literature on the traditional theory of project management and project cost controls. The empirical review will also concentrate on project cost management practices in general.

2.1 Theoretical Review

Here the basic theories and principles underlying the study will be looked at. The theories under consideration relates to the conceptual framework of project and project management.

2.1.1 An Overview of Projects, Project Management and Project Cost Management

Unlike the relatively steady state of an ongoing enterprise, a project has some distinctive characteristics of its own. Such undertakings usually have a well-defined starting point and a well-defined objective which identifies the completion of the work. Furthermore, resources are limited in one way or another place constraints on the work to be accomplished and underline the need for special management controls.

Projects are typically defined as follows:

A temporary organization to which resources are assigned to undertake a unique, novel and transient endeavor managing the inherent uncertainty and need for integration in order to deliver beneficial objectives of change (Turner & Müller, 2003).

Any undertaking with a specified beginning and established goals, the achievement of which symbolizes the end. In real world situations all projects rely on finite resources with which the set targets are to be met (PMBOK, 2013).

They are supposedly used to achieve non-repeatable and arguably unique outputs, although it is now accepted that project –based principles are applied to many other types of work within organizations, especially where change is endemic (Williams, 2005).

Reiterating Henri Fayol in his definition for management in his book Administration Industrielle et Generale (1917), to manage is to forecast and plan, to organize, to command, to coordinate and to control. To forecast and plan means examining the future and drawing up the plan of action. To organize mean to build up the dual structure of manpower and material of the undertaking. To command means maintaining activity amongst personnel. To coordinate means bonding together, unifying and harmonizing all activities and efforts. To control means seeing everything occurs in conformity with established rules and expressed command. Some rules and command may however, be implied.

Project Management is therefore, the skill and systematic methodology to directing and coordinating manpower and material resources throughout the life of a project which is achieved through the usage of modern management techniques to meet specified objectives (PMBOK, 2013).

The principal characteristic of a project is its novelty. It is often a step into the unknown, fraught with risk and uncertainty. No definition of project cost, particularly in the mining industry can be exhaustive. Project cost is that which is expended on assets creation activities in the mining industry that has the potential for a future return. Cost Control as defined by Neil J.M. (1982) is the processing of raw information received from projects, operating divisions, and special staff division and relating this information to various project cost estimates and schedules for

the purpose of presentation of results in the form of reports to all levels of company managerial, the client and outside agencies. According to Eweje et al (2011), cost control of a project involves the measuring and collecting the cost record of a project and work progress. It also involves the comparison of actual progress with the planning. Control of the project cost consists of material cost control, equipment, manpower, subcontractor, overhead cost and general condition (Veronika et al, 2006 as cited in Müller, 2012).

Project cost management is the practice of ensuring optimal project expenditure whilst retaining the benchmarked levels of quality as well as the scope of deliverables for the life of the project.

2.1.2 Cost Objective and Definitions

Every project should be controlled against be controlled against detailed cost budget to ensure that expenditure authorized in its charter is not exceeded. Projects should be completed within the budgetary constraint imposed on them. Control is predominantly accomplished by means of the imprest principle which states that no costs can be ratified without a previously commitment being in place. The ultimate foundation of this principle is that spending is not allowed unless there is an approved fund available for such transaction.

Costflow is defined as the point in time when any task or piece of work has been completed and certified as per the project schedule and scope, and when payment for such work has been sanctioned. In other words, the moment any cost is inherently due, irrespective of whether it has been invoiced or not. This follows accrual concept which states that cost incurred on a particular task or activity should be recognized as expense and accounted for. Cost Projection is a prediction of costs at completion of a project and where potential future savings is made possible.

This is depicted in the Figure 2.1 below:

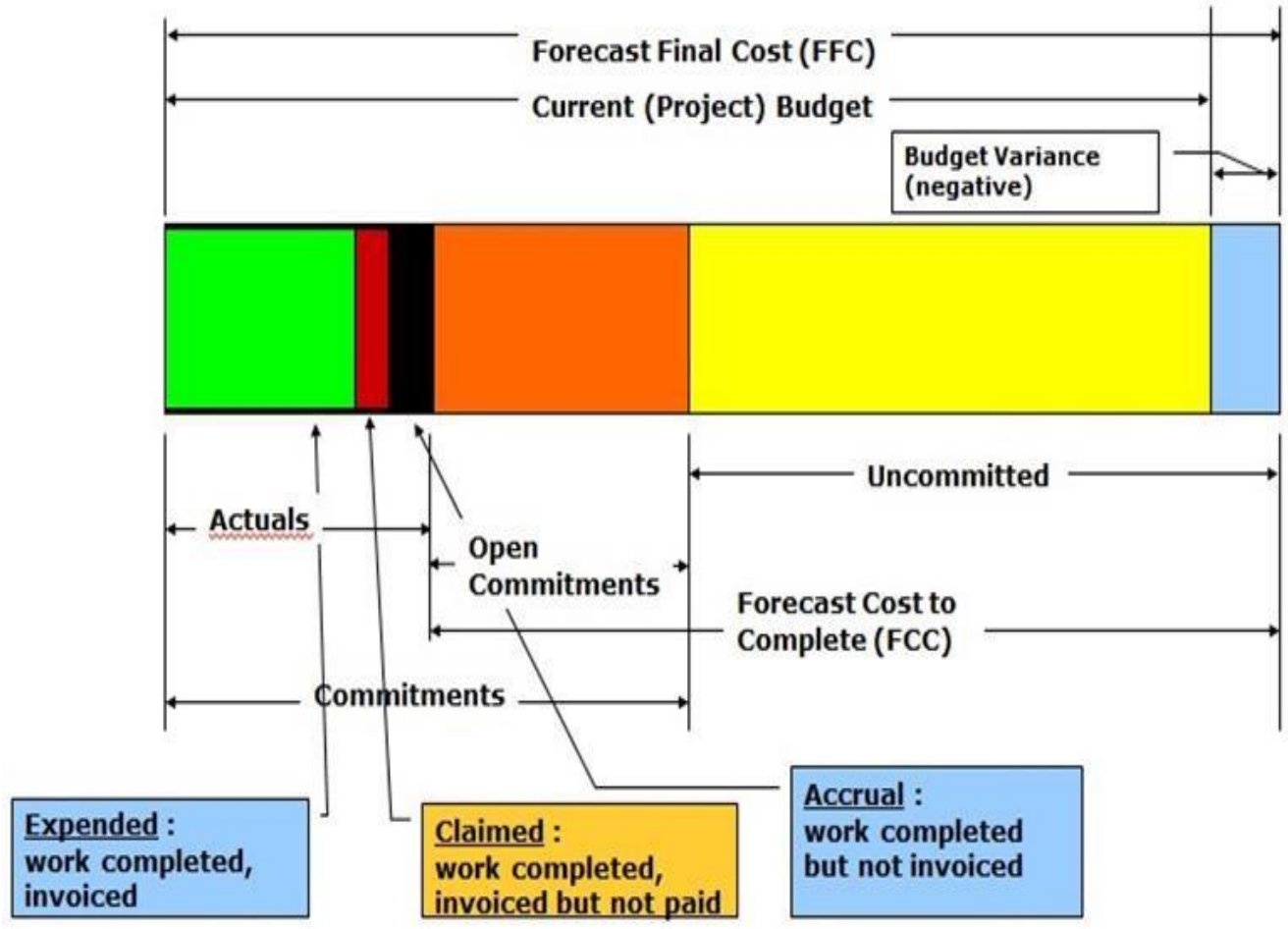


Figure 2.1: Project Cost Projection (Source: Osei, 2012)

Project Cost Reporting is essential in project cost management and must give a fair and accurate overview of the project cost position even though the entire true cost of the temporary endeavor may not even be known as a result of project complexities of cost collection, cost apportionment and accounting methods which may be bias. This is necessary for managing variances and exceptions. Project Cost Reporting should be prompt, timely and accurate.

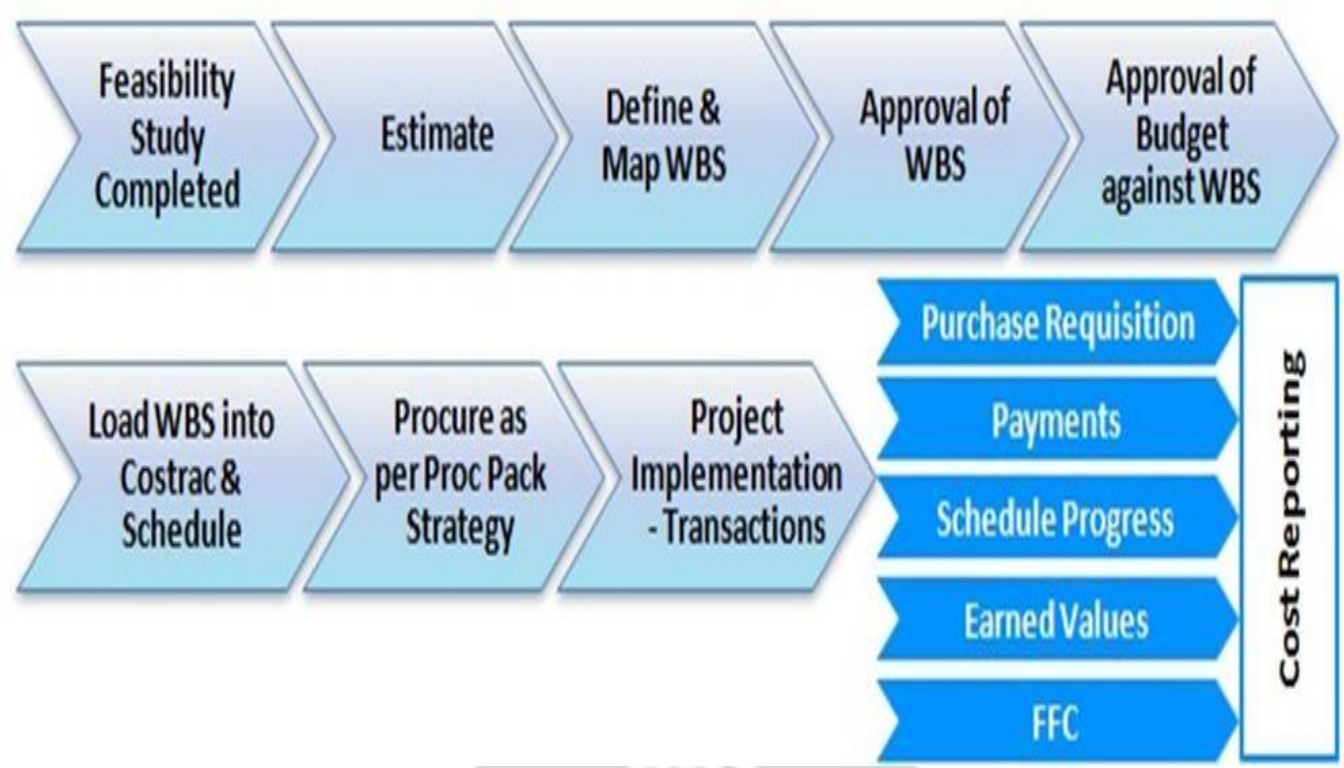


Figure 2.2: The Project Cost Report (Source: Adopted from PACE Services, 2011)

Opportunity Cost is the next best alternative forgone.

Project cost are normally associated with the short run period. Before a project is chosen, the firm is in a long – run situation in the sense that management can decide on any one of a wide range of alternative projects which may be constraint the availability of funds or capital and profitability. After the investment decision is taken and funds committed to a project, the firm operates under short run conditions. In the traditional theory of cost, the total cost is divided into total fixed cost and total variable cost.

Sunk Cost is a cost that would have been incurred irrespective of whether the project is progressing or not. It is as a result of previous choices made.

Overheads are intrinsic liability expenditures which occurs during the life of a project and cannot be associated directly with a task.

Direct Cost is an expense that can be measured and attributed entirely to a specified task or a project.

Indirect Cost is a cost incurred generally in the life of the project and cannot be assigned to a peculiar task or activity in the project.

Fixed Cost is a type of cost that remains unchanged irrespective of the changes in the level of task.

Variable Cost is a cost that changes in direct proportion to changes in the level of task

Statistical cost studies consist of the application of regression analysis to time series or cross section data. Time series data include observation on different magnitudes of a firm over time.

Variations in costs come about as a result of many micro and macro factors in the economy which may include inflation, deflation, taxation, price escalations, and foreign exchange rate fluctuations.

2.1.3 The Concept of Mining Project

Mining is one of civilization's most primitive undertakings and undoubtedly one of its foremost structured industries (Runge, 2010). The uniqueness of mining accounts for the intricacies in mining projects.

Mining projects are characterized by high investment outlays, high risk and complexities, communal agitations and litigations, and regulatory challenges. Large construction projects and mining projects may share risks with similar characteristics because both are uncertain, complicated and costly

Cost classifications that must be controlled can be determined from knowledge of the mining system. Customary cost classification normally determine project cost base on the life stages of a typical mine being prospecting, exploration, development, exploitation and reclamation.

2.1.4 Project Cost Management Processes

Project Cost Management includes the processes involved in planning, estimating, budgeting, and controlling costs so that the project can be completed within the approved budget.

PMI (PMBOK, 2013) categorizes project cost management processes into four major processes which are Project Cost Management Planning, Project Cost Estimation, Project Cost Budgeting and Project Cost Control. These processes are explained below:

Project Cost Management Planning –This process happens in the early stages of project planning and sets the framework for the other cost management processes so that performance of the processes will efficient, effective and well-coordinated. It establishes the policies, principles, documentation, procedures and reporting for planning, managing, expending, and controlling cost of the project. It serves a guide to directing how the project cost are managed throughout the project life cycle. Normally, a project cost management plan is the outcome of this process. It sets out the format for and establishes the criteria for planning, structuring, estimating, budgeting, and controlling project costs.

Project Cost Estimation – Reliable cost estimate are necessary for all projects. Without a cost estimate it would be impossible to prepare, establish detailed budgets, predict resource requirements or control projects. It form the basis of project cost control (Lock, 2013). Level of details required, most definitely will determine a ballpark estimating, top down estimating, bottom up estimating, parametric estimating, analogous estimating, three point estimating or

an expert judgement. Cost estimate must be reviewed and refined during the life of the project to reflect additional detail as it becomes known and assumptions are tested. It is a process of developing an approximation of the monetary resources needed to complete project activities. It includes the identification and consideration of cost alternatives to initiate and complete the project.

Project Cost Budgeting is the aggregation of all estimates of all project activities to establish a total budget. It also includes contingency and escalation allowance but excludes management reserves. Project budgets constitute the resources and funds approved to the implement the projects. The principal merit of this process is that it produces a cost baseline for which performance can be measured against.

Project Cost Control is the process of monitoring, measuring, forecasting, updating and taking corrective actions to make sure project remains in line with the approved budget. The tenet of cost control also includes change management system. It includes the following according to PMI (PMBOK, 2013);

- Influencing factors that create changes to the cost baseline
- Ensuring requested changes are agreed upon
- Managing actual changes as and when they occur
- Acting to avoid and eliminate expected overruns
- Preventing unapproved change from being included in the reported cost or resource usage
- Monitoring cost and work performance against funds expensed, isolating and comprehending variances from the approved cost baseline.
- Informing appropriate stakeholders of all approved changes and associated cost

According to Mandel and Meredith, there are three types of controls which are as follows;

- Go/No-Go Control
- Post-control
- Cybernetic Control

Project cost control is the capacity to anticipate and recognize project cost variations and apply the necessary preventive or corrective mechanisms.

2.1.5 Performance Reviews

During project implementation it is of uppermost importance to monitor and control the project. Since projects have one or more constraints (time, budget, scope or performance) set by the stakeholder or the project sponsor, these constraints require particular monitoring. Once, the baseline is set for schedule and budget, the ongoing current status can be compared and evaluated against the original estimates. During the duration of the project, cumulative work or budget can be broken down by time (Pinto, 2007). Performance reviews compare cost performance over time, schedule activities or work packages overrunning and underrunning the budget, and estimated funds needed to complete work in progress. The

Earned Value Management is used to determine the following information:

- Variance Analysis
- Trend Analysis
- Earned Value Performance

Variance analysis as adopted earned value management matches actual project performance to planned or expected performance.

Trend analysis scrutinizes project cost performance over time to determine if performance is improving or deteriorating.

Earned Value Performance matches the baseline plan to actual schedule and cost performance.

Milestones are events or dates in the project where significant deliverables are completed.

The deliverables can be one single task or a combination of several different tasks. Milestones give indication to the project team of the current status of the project and especially in multiyear projects provide a good picture of the overall progress (Pinto, 2007).

The classic S-curve displays graphically the actual accumulated amount of cost or work against time. The analysis is done for both the actual cost or work and the planned cost or work. Any variation between actual and planned can potentially signify a problem (Guilherme, 2012).

Simplicity is the biggest advantage with the S-curve analysis. It offers real-time information of the project status in a timely manner (Pinto, 2007). Simplicity can also be considered as the biggest downfall of the S-curve. The information it provides is not always easily interpreted. The S-curve provides an easy way to identify positive or negative variance but does not give any indication as to the cause of this variance (Pinto, 2007)

2.1.6 Project Management Lifecycle Cost and Total Cost Management

Lifecycle cost includes not only cost associated with delivering the project, but also of enhancing, maintaining and ultimately decommissioning it. The merit of the usage of a lifecycle cost analysis is that it places the complete cost of project into perspective.

Project expenditures are resource outlays designed to generate a stream of future economic benefits over the life span of the asset created whether intangible or tangible. Project investment analysis which is the process of planning and evaluating such economic burden to the firm and committing the firm's resources to the expansion of its productive capacity, an improvement in its cost efficiency, or a diversification of its asset base must be not only be done for the life of the project but the entirety of the asset or product created. The following are project investment analysis processes below;

- Generate alternative projects investment proposals.

- Estimate cost-flow and funding, value engineering and incremental costs analysis among the alternatives.
- Project the streams of revenue among the alternatives.
- Evaluate and choose from the alternatives available, the most feasible and suitable investment projects to implement.
- Review and take corrective measures regularly during the life of the project and after the investment project has been executed.

2.1.7 Project Cost Accounting, Control Account and Closure

Project cost accounting refers to the process of measuring, reporting commitment and cash outlays on the project. This measurement of money is the function of the traditional accounting and payroll processes and systems (TCM Framework, 2006).

The accounting process excludes the performance measurement process which covers the management of the degree of completion of scheduled activities of a project. Project Cost Management regularly checks that costs recorded are accurate. Cost data are commonly misfiled, miscoded, improperly invoiced or otherwise mischarged.

Project cost accounting ends when the cost accounts are closed in the cost control account system. Before closing the accounts, it is usually a project cost control role to ensure that all charges to cost accounts are complete and that cost are recorded in the right account.

2.2 Empirical Review

This section covers a review of works or research on the application of project control strategy in specific sectors of the economy or in the economy as whole of different countries and the resulting outcome. It also looks at existing literature on project management and project cost management.

2.2.1 Transaction Cost Economics

TCE focuses on the level of transactions that converts "inputs" to desired "output". Inputs may refer labour, material, equipment and monetary resources whilst output may also refer to the project deliverables. As posed by Williamson (1996), transaction costs are comparative costs of planning, adapting, implementing, monitoring and controlling to the completion of transactions under a project. TCE suggests that firms utilizes project governance systems that achieves an optimal transaction cost. This is usually done by selecting the best contract type between the buyer and seller. As was recognized by Williamson (1996) as three facet of TCE:

- The magnitude of asset specificity as the prominent cause. This is the degree to which the object of the transaction is peculiar to the distinct transaction and cannot be redistributed in the future transactions.
- The extent to the vagueness that arises (a) from an absence of communication or conscious supply of wrong and misleading signals, inhibiting a decision-maker finding out about the plans made by others in the transaction; and (b) the broad uncertainty in human behavior; as well as (c) the over-all risk of the endeavor.
- The frequency of the transaction. TCE was originally developed for repetitive, routine transactions, undertaken by the classically managed organization in functional and hierarchical structures but this study applies in the area of non-routine tasks.

In project conditions, TCE is usually appropriate during the presales phases, up to contract award (Müller & Turner, 2005).

Transaction costs perspectives are typically at the project level in order to optimize on the cost of projects. In the case of high occurrence of projects. The focus may better be raised to the portfolio level, to optimize on transaction cost during the life of the project.

2.2.2 Control Perspective in Projects

Project cost management is still commonly agreed as the practice of the planning and management in order to complete projects within the authorized project budget. The stringent application has been over emphasized. A research by Jugdev and Müller (2005) over the last 40 years on evolving comprehension on project success suggested that numerous reasons accounted for various project successes other than the traditional view. Sole concentration on the "iron triangle" has led to competition among projects with an adverse effect on the results of all tasks in a project. It has been argued by Kerber and Buono (2003) that planning and control, is a tool most appropriate for bureaucratic firms. Turner and Müller (2004) showed empirically that project cost control is best achieved in medium levels of structure, with neither too high, nor too low levels of control.

However, plans should augment project control according to Mikkelsen and Riis (1989, p.23). Therefore, control system should be placed in methodologies and create cost and schedule goals from the onset of the project.

2.2.3 Project Cost and Risk Management in Mining

A study of eighteen mining projects covering period of 1965 to 1981 showed an average cost overrun of 33 percent compared to their feasibility study estimates (Castle, 1985). A study of sixty mining projects covering the period from 1980 to 2001 showed average cost overruns of 22 percent with almost half of the projects reporting overruns of more than 20 percent (Gypton, 2002). A review of sixteen mining projects carried out in the 1990s showed an average cost overrun of 25 percent, attributed to overly optimistic feasibility studies and poor cost estimation (Anon, 2000, as cited in Noort & Adams, 2006). Therefore, a standard approach to mining project management, effective tools that can be utilized to meet the project objectives, and studies regarding risk factors

associated with mining projects, are required to develop the current project management status of the mining industry.

Mining project activity is subject to high risks because of its size, uncertainty, complexity, and high costs. Large engineering projects are high-stakes games characterized by substantial irreversible commitments, skewed reward structures in case of success, and high probabilities of failure (Miller & Lessard, 2001). Floricel and Miller (2000) suggested that large scale projects such as power plants, highways, bridges, tunnels, and airports developed in the last 20 years have become increasingly characterized by turbulence resulting from radical shifts in institutional frameworks, political and economic discontinuities, environmental and social activism and, to a lesser extent, technological changes and innovations. Risks caused by these turbulences ought to be considered by project managers for a successful project implementation. The extent of risk and uncertainty associated with construction projects, particularly in remote locations is considerable and should not be underestimated (Perry, 1986). Mining projects are commonly implemented in distant locations, which explicate its need for careful risk management. Risk management becomes an integral part of project cost management and plays such an important role that its application goes beyond the traditional scope which normally center on the construction phase (Del Cano & de la Cruz, 2002). In the development of an oil field enormous number of issues involved and a lot of risks are associated to them. The limited knowledge about the characteristics of the geological formation, technical facilities, and human behavior results in considerable uncertainty about the oil and gas wells drilling operations (Jacinto, 2002).

2.3 Project Cost Management in AngloGold Ashanti - Obuasi Mine

Currently there is no integrated project cost and schedule control system available to facilitate the project cost management. AGA does a manual input into Costrac and a manual reconciliation done with the Business Process Cost System (BPCS), Procurement and Contract Reports.

Four main activities can be identified within the tracking process. They are

- Requisition, Direct Material Indent (DMI) and Capital Indent (CI), Delivery Instruction Note (DIN) and Contract Booking.
- Validation and Approved and Unapproved Budget Availability Check.
- Tracking and Reconciliation.
- Database for procurement and expediting.

Requisition / DMI Booking:

Upon receipt of a capital requisition from an overseer, the following details are captured in the costrac. They are

- Requisition / DMI Book Serial Number/ Capital Indent Reference Number/ Contract Reference Number
- Date Received
- Capital Project Code and Description
- Item Description
- Quantity
- Currency
- Currency Amount
- US$ Equivalent

- Unit Cost
- Estimated Cost
- Order Type
  - R – Requisition
  - DMI- Direct Material Indent
  - CI – Capital Indent
  - DIN – Delivery Instruction Note
  - C- Contract

Other Information in costrac includes the following:

- Project approved budget
- Available Balance (Calculated as Budget – Capital Receipt (CR))
- Commitment Value
- Actual Value
- Actual Date Item is taken from stores
- General Remarks

Validation and Budget Availability Check:

This step involves checking to ensure that the right Project Code is allocated; whether the item to be purchased is within the scope as defined in the Work Breakdown Structure (WBS). Budget availability check is then done. If all the aforementioned requirement are met, the necessary authorization is given for the item to be drawn from stores or place order or contract. Otherwise requisition is disallowed.

Stores Requisition and DIN Tracking and Reconciliation

The tracking process involves tracking the requisition from what is commonly termed the Commitment Stage to the Actual Stage, where the item is drawn from the stores by the overseer. The requisition remains at the commitment stage until the overseer picks the stores by the overseer and is accordingly debited with the actual cost of the item.

The commitment value which at this stage is equivalent to the estimated cost is entered into costrac as part of the booking activity. When the overseer is debited, the actual amount is moved from commitment column to the actual column in the system at the end of the month by finalizing and approving transactions.

If variance is detected in the actual cost from the estimated cost and the quantities as well, comment is then made at the general remark column.

The basic formula for the reconciliation process is given as follows:

Capital Receipt = Commitment + Actual

DMI/CI/Contract Tracking and Reconciliation

The process of tracking is basically the same as the requisition tracking process involves all the Signature stage through to the Indent Stage, then on to the commitment stage and lastly the actual stage. The estimated/ approved cost is captured at each of these stages. Comments are made if deviations are detected.

The basic formula for the reconciliation process is given as follows:

Capital Receipt (CR) = Signature Amount + Indent Amount + Commitment Amount + Actual Amount

Labor Cost, Workshop Orders, Restaurant Charges, Accommodation and Transportation do not pass through the system. Cost only reflects at the end of the month.

Procurement and Expediting

Upon request for purchase of capital material for a project from an overseer, the following are carried out and captured in a procurement section in costrac database:

- Enquiry for quotes
- Raise Capital Indent/ DMI (assign Reference and Item Number)
- Follow through for signatures
- After fully signed, the DMI/CI is forwarded to Materials planning
- Follow up / expediting
- Delivery Notification to end users
- Checking the delivered item with end user (quantity and specification).
- Issuing Capital requisition for withdrawal or collection of items delivered
- Update of the database

Below is a process framework of AGA Obuasi Project Cost Management;

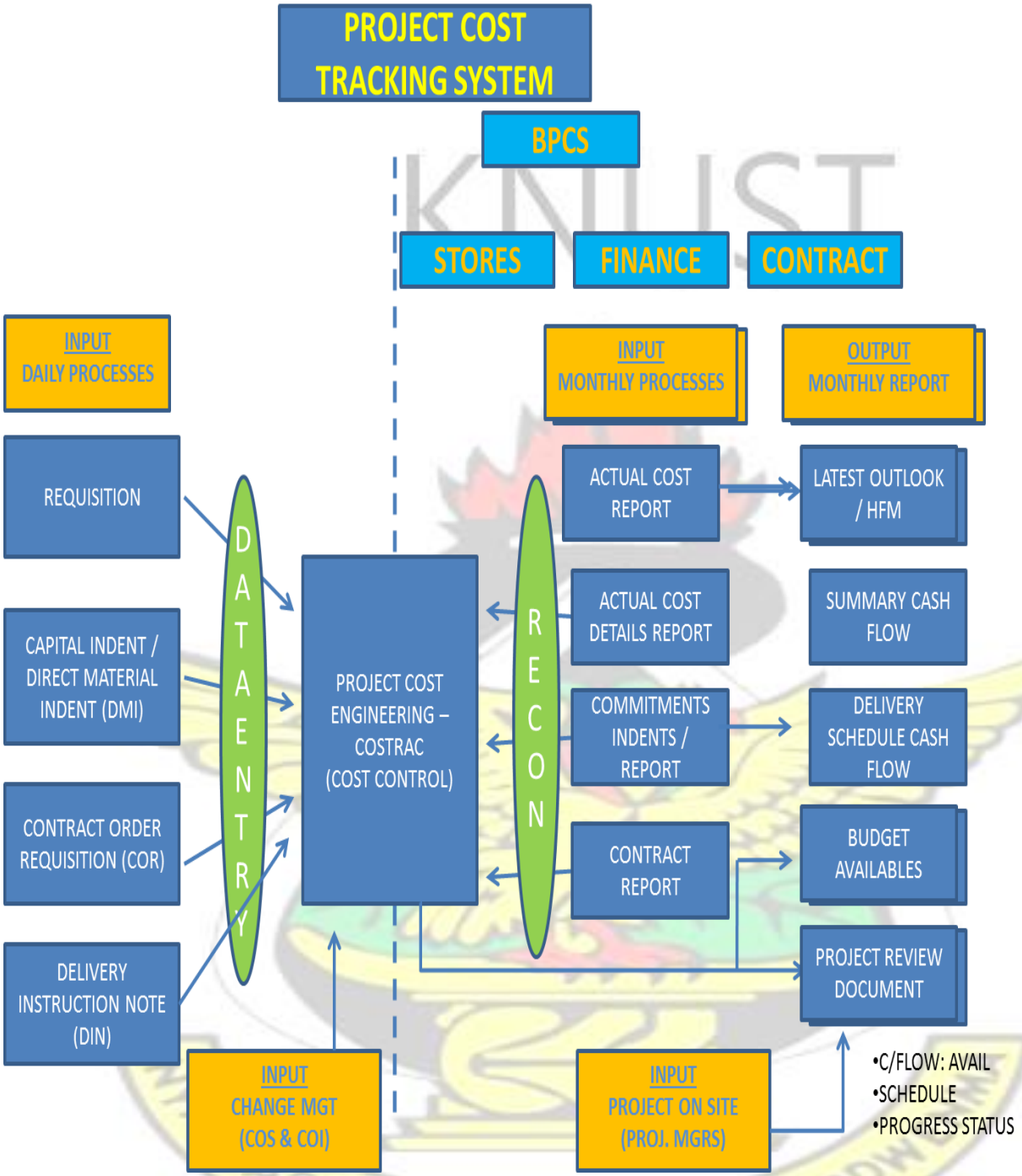


Figure 2.3: Project Cost Framework (Source: Osei, 2015)

CHAPTER THREE

RESEARCH METHODOLOGY AND ORGANISATIONAL PROFILE

3.0 Introduction

This chapter seeks to give a general overview of how the study was conducted. The research was based on both qualitative and quantitative data. In gathering the qualitative data, questionnaires were administered and interviews conducted within the Obuasi Mine.

3.1 Research Methodology

Research design is the overall plan for relating conceptual research problem to relevant and practical empirical research. The quality of empirical research is greatly influenced by the underlying research design. The researcher adopted a descriptive survey design for the study.

According to Gabble (1994), a descriptive survey involves the collection of data through the use of questionnaire or interview or ability test. Gabble (1994) adds that descriptive research involves the collection of data in order to test hypothesis or answer research questions concerning the current status of the subject of the study. A descriptive survey was considered appropriate for the study because it will allow the use of questionnaire and interview schedule where necessary to seek for in-depth information from selected respondents.

3.2 Population, Sample Size and Sampling techniques

The population from which sample is picked for this study included all staff and employees at AGA. Using purposive sampling, it was however narrowed to the project and feasibility team (department) as well as senior management including the various project sponsors at AGA. Each questionnaire was filled by all staff at the project department as well as the project sponsors. In addition, the various senior managers at AGA were also sampled for additional

information through interviewing. This was done in order to gain an in-depth information. A sample size of forty nine (49) was picked out of a population of fifty seven (57) staff at the project department.

A survey method was used to collect data for this study. This was suitable because all participants fundamentally answered identical set of questions. Purposive and Stratified random sampling methods technique were used to select my sample because of the various groups. Even though this technique may tend to give some degree of an illusory data, the capability and professionalism of the sample size could be relied upon to give a coherent and precise information.

3.3 Methods of Data Collection

Data was collected mainly through the use of questionnaires and interview. Merging and integrating the two methods as postulated by Johnson and Onwuegbuzie (2004) is very vital because there is some sort of synergism associated with their collective usage by way of each supplementing the other's strengths and weakness. The questionnaire has two key sections. Part one covers wide-ranging demographic questions while part two covers the project cost management subject matter. Questionnaires are used since the respondents answered the same type of questions. The use of questionnaires is useful as they permit anonymity and produces higher response rate. The questionnaire schedule is made and will be delivered by the researcher to the respondents. The researcher made follow up calls to respondents for clarifications where necessary. The respondents were re-assured of the confidentiality of information given.

3.4 Sources of data collection

The relevant data for the study were collected from both primary and secondary sources. According to Sauders et al (2005) primary literature sources are the first occurrences of a piece of work. They include published sources such as reports and some central and local government publication such as white papers and planning documents. In my work, the primary source in the form of questionnaire/personal interview designed and administered to selected staff at the finance and operations departments as well as senior management including the project sponsors at AGA.

Secondary data source according to Saunders et al (2003) are sources such as books and journals are subsequent publication of primary literature. The secondary source were also obtained from textbooks, published journals, annual report, newspaper publication, description of past students, and industry analysis offered by media and web sites on the internet.

3.5 Method of Data Analysis

Data analysis is a critical and careful examination of material or data in order to understand its parts, and the relationship between variables and to discover its trends (Creswell, 2013). Data collected from the use of questionnaires and interviews will be analyzed both qualitatively and quantitatively. The data would be coded and analyzed using Statistical Package for Social Solution (SPSS) software, version 22. Qualitative data analysis are nonnumerical data that have not been quantified while quantitative data analysis refers to all such data that have been quantified by the use of frequency tables, graphs and diagrams to make them more understandable and meaningful (Saunders et al, 2009). Data analyzed were presented in the form of graphs, histograms, pie charts and frequency tables for easy understanding of analyzed data.

3.6 An Overview of AngloGold Ashanti (GH) Limited, Obuasi Mine (AGA)

AngloGold Ashanti formally Ashanti Goldfields Corporation is a gold mining company based in Ghana that was founded by Edwin Cade. The Ashanti Mine, located at Obuasi, has been producing since 1897. Obuasi is in the southern part of the Ashanti Region, located 60 km south of the regional capital city, Kumasi. There is a paved road access to Accra (which joins the main Kumasi to Accra road) with a driving time of between 4.5 and 6 hours. AngloGold Ashanti charters flights to Obuasi Monday to Friday, and there is a daily service to Kumasi from the international airport at Accra. The mine is sited on one of the world's major gold deposits and is one of the ten largest in the world. In 1994, the Ghana government, the majority shareholder, announced plans to sell 20-25 percent of its interest in AGC in a share flotation. The company was listed on the London and Ghana stock exchanges. It was the largest flotation ever organized by any gold mining company coordinating and advisory team alone numbered over 200 people.

In 2004, it merged with AngloGold to create the world's second-largest gold producer, AngloGold Ashanti Company. AngloGold is based in South Africa and majority-owned by Anglo American group. Late in 1897, the principals of the newly formed Ashanti Goldfields Company had a belief to build an indigenous Gold Coastal Company; little did they know that their idea would mature to be a flagship African company and Ghana's foremost earner of foreign exchange.

AngloGold Ashanti is involved in the exploration, development, and mining of gold. It is primarily an underground operation, although some surface mining still takes place. The main activities can be classified as production and processing of Ore.

The process of producing gold can be divided into six main phases which are finding the ore body, creating access to the ore body, removing the ore by mining or breaking the ore body,

transporting the broken material from the mining face to the plants for treatment and Processing; thus the breaking up of ore to make gold available for treatment. Conventionally, this process occurs in multi-stage crushing and milling circuits. Modern technology is based on large mills fed directly with run-of-mine material

Mining activities require other extensive services, both on the surface and underground, including: Mining Engineering Services, Engineering Support Services, Processing, Mine Planning and Modelling, Sustainable Development and Community Relations, Commerce and Finance, General Mining Administration and Human Resource Services, Safety, Health and Environment, Information Systems and Projects and Feasibility Services.

CHAPTER FOUR

ANALYSIS AND DISCUSSION OF FINDINGS

4.0 Introduction

This chapter centers on the organization, presentation and analysis of the data collected from the various participants under the study which focused on the evaluation of project cost management. The chapter contains an analysis of the data as well as findings. This chapter is organized, based on the following; the background of the participants, assessment of project cost management to meet set objectives, examination of project cost management processes, the contributing factors accounting for variances (if any) and alternative technique and system to resolve and manage project cost and end with the difficulty pertaining to project cost management. The results presented in this chapter were based on the sample size of 49 project management and feasibility study personnel from the following sections: Projects Capital Management, Projects Planning/Scheduling, Project Cost Management, Projects Claims Management and Project Execution (mining, processing, engineering, environment & closures, commerce & finance); as well as the Project Sponsors. Spreadsheets were used to manually analyze the data gathered both tabular and graphical.

4.1 Background of Participants

Participants were asked of their age, sex, educational laurel achieved, nationality and other related areas. The findings with regard to the background of the participants are represented in Table 4.1. The study sampled 49 personnel from the projects and feasibility team. 87.76% of the participants were men with the rest being women (12.24%). This has been the order of the

day for most mining firms which is overwhelmingly male dominated. Women have been noted to be very cautious and particularly chose to avoid the hazards associated with the mining industry.

With the labor restructuring that started in October, 2013 and ending in February, 2015, the current labor force has been youthfully dominated, the study reiterated this strategy by management of AGA. The study revealed that 81.63% were under the age of 45yearsWith specificity, 46.94% were under the age of 30years mark, and 34.69% were between the ages of 30-45years whilst only 18.37% were above the ages of 45years.

Table 4.1: Background of Participants

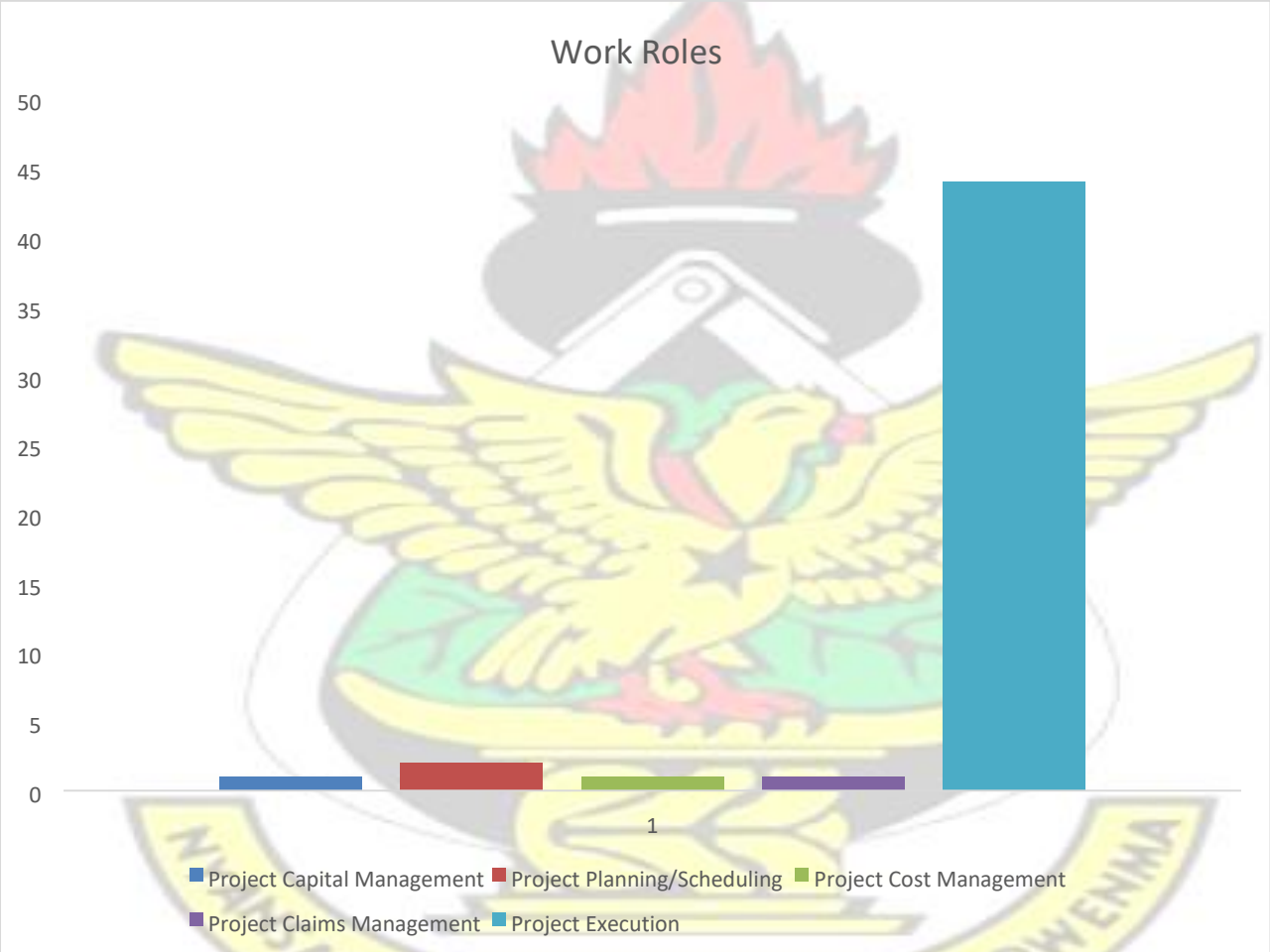
Background of Participants	Frequency	Percentage (%)
Sex		
Male	43	87.76
Female	6	12.24
Total	**49**	**100**
Age		
<30years	23	46.94
30-45years	17	34.69
>45years	9	18.37
Total	**49**	**100**
Educational Background		
Academic	42	85.71
Professional	7	14.29
Total	**49**	**100**

Source: Field survey 2015

Educational background of participants checked whether the participant were either scholarly or vocationally certified. The study showed that most personnel were employed based on their

academic certification from recognized institutions. It became particularly known that a vast majority (85.71%) had academic qualification with only 14.29% being vocationally proficient and were all part of the project execution team. The reader is however cautioned that, those with professional or vocational qualification also had at least, some basic level of academic education.

Figure 4.1a: Roles of Participants



(Source: Field survey, 2015)

Supplementary to the above background of participants, the study also explored the nationality and the nature of work and roles which participants in the project and feasibility department were deployed to do. The findings are represented in the charts below;

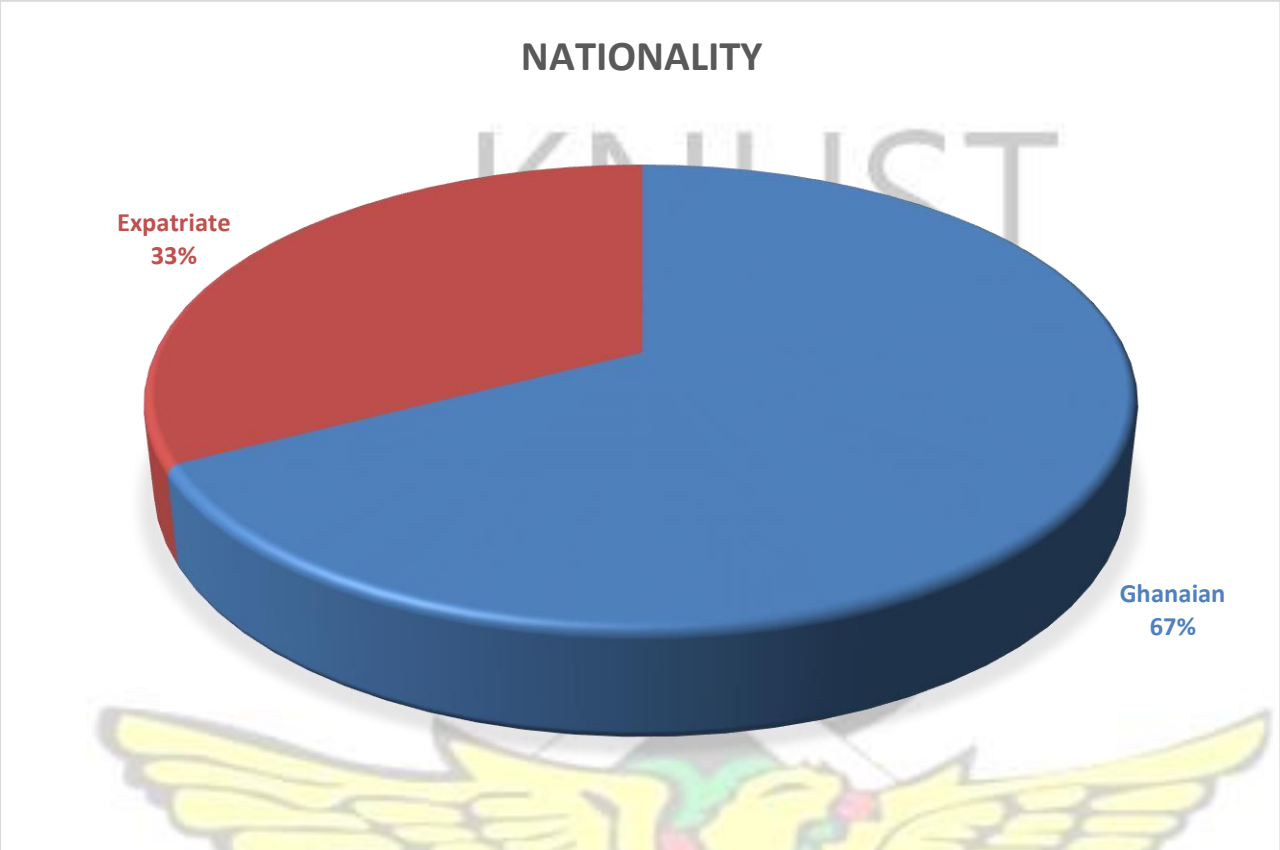


Figure 4.1b: Nationality of Participants (*Source: Fieldwork, 2015*)

From Figure 4.1a, it was realized that 44 (89.80%) out of the 49 participants in project and feasibility team were engaged in project execution whilst only 5 (10.20%) personnel were engaged in project and feasibility controls.

Figure 4.1b also depicts the nationality of participants in the study with slightly above twothirds (67.35%) being Ghanaians and almost one –third (32.65%) being expatriates; mainly Australians and South Africans.

4.2 Do projects achieve specified objectives and budgetary requirement?

Project objectives will be considered under this section in relation to investment ventures under the supervision of the projects and feasibility team which were undertaken with set of objectives, most critically the cost objective. Furthermore, this category takes a closer view as to whether these objectives (scope, time and cost) were met in terms of execution and final deliverables, and the factors that accounted for any deviations.

In examining the issue above, participant were asked to indicate if projects previously undertaken and current ones had predefined goals. This was principally vital as, it has been prescribed in the working definition of project cost management and investment spend that *"Meeting or exceeding stakeholder needs invariably comprises of balancing trade-off among scope, time, cost and quality of projects"- (AngloGold, 2012, p. 2).*

The field findings pointed out that a vast number (93.88%) of the participants answered in the affirmative to confirm that projects had indeed specified goals whilst only 6.12% replied that projects undertaken in AGA, Obuasi mine had no objectives. The finding is depicted in the chart below

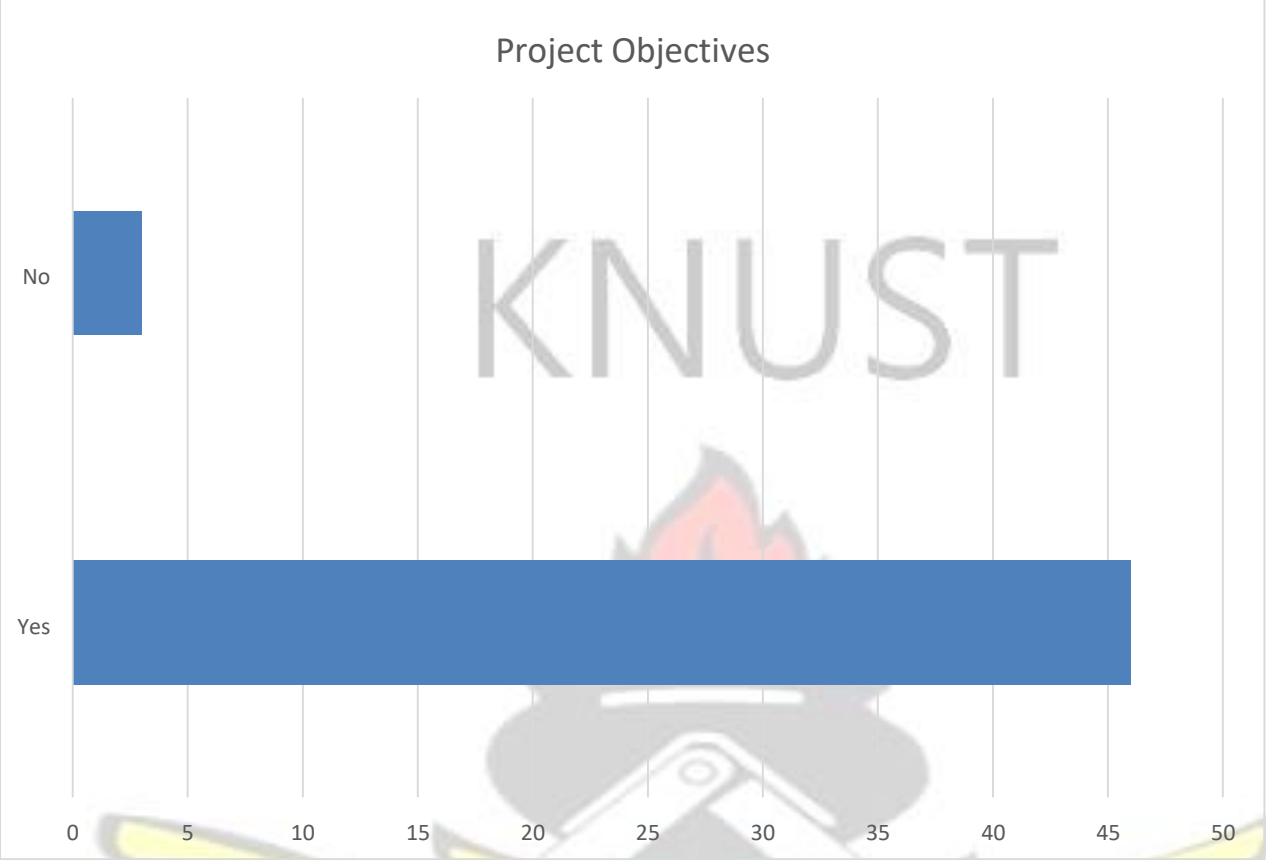


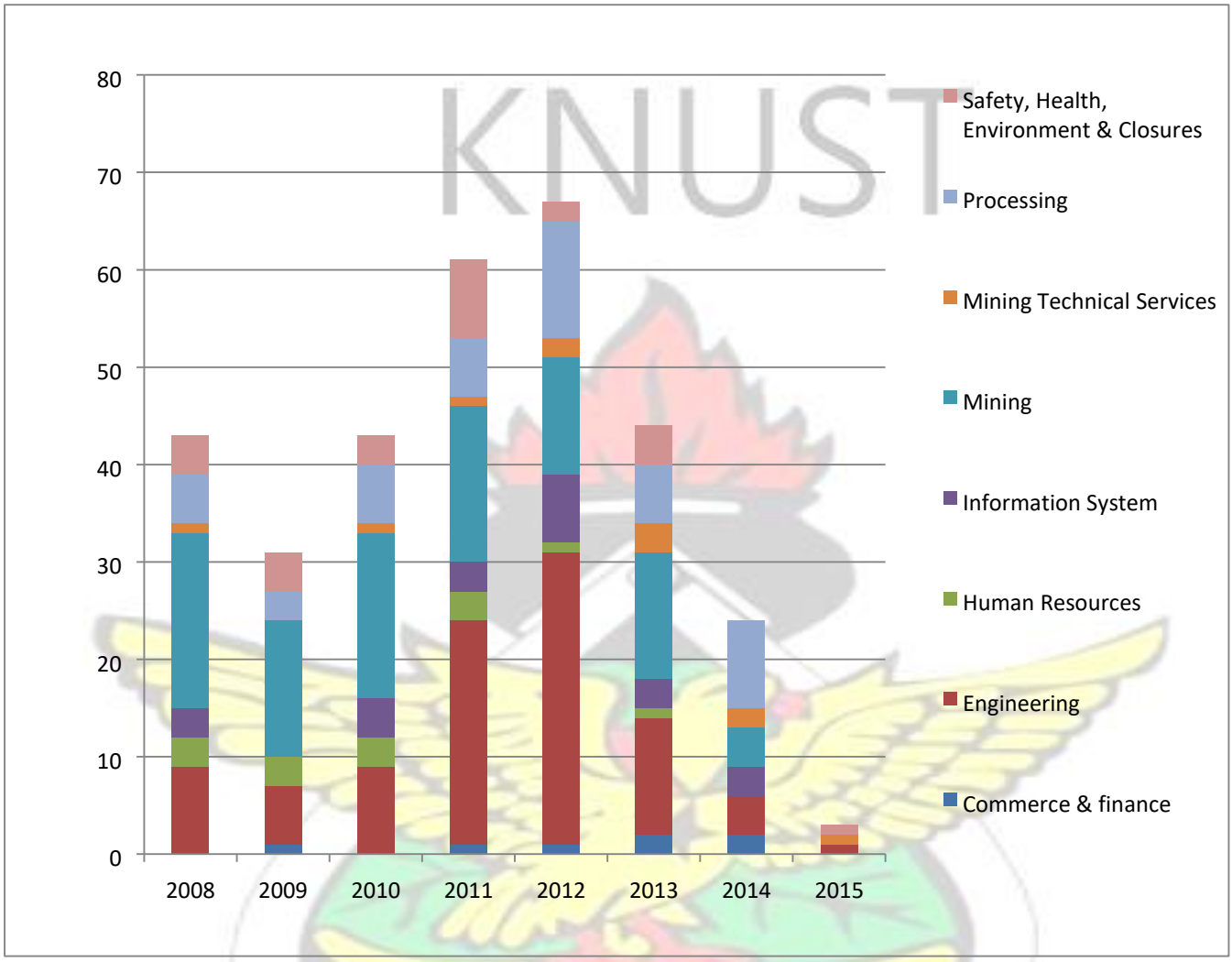
Figure 4.2: Projects achieving specified objectives

Source: Field survey, 2015

Further to the findings indicated above, participants were also required to indicate if the projects undertaken met their defined cost objective and budgetary target. It was however, a split decision as 46.94% participants being the minority answered positive whilst 53.06% being the majority answered negative that the projects undertaken did not meet the defined cost objectives. This is a direct contradiction of the objective of project cost management at AngloGold which stipulates that:

"The aim of project cost management is to ensure that projects funds are effectively and efficiently monitored and controlled, resulting in projects completing within budget, on time, and within the over-all performance expectations as originally planned and for which approval

was given." (Project Cost Management Framework – AngloGold Ashanti, 2012) **Figure 4.3a: Distribution of Projects**



Source: Field survey, 2015

Historical data pulled from various 316 projects from 2008 to 2015 also proved this contention of projects not meeting the projects objective of cost, as answered by participants. A vast number of scope were eliminated from various (144) projects in order not exceed their budgets, thereby defeating the strategic purpose of the implementation of such projects with their end results being white elephants. Figure 4.3 gives a colorful representation of investment projects undertaken with their respective expenditures between 2008 and 2015.

Projects have been categorized in commerce & finance, engineering, human resources, information system, mining, mining technical services, processing, and safety, health, environment and closures. Most of these projects (59.49%) were largely concentrated on mining and engineering with 40.51% concentration on the remaining areas.

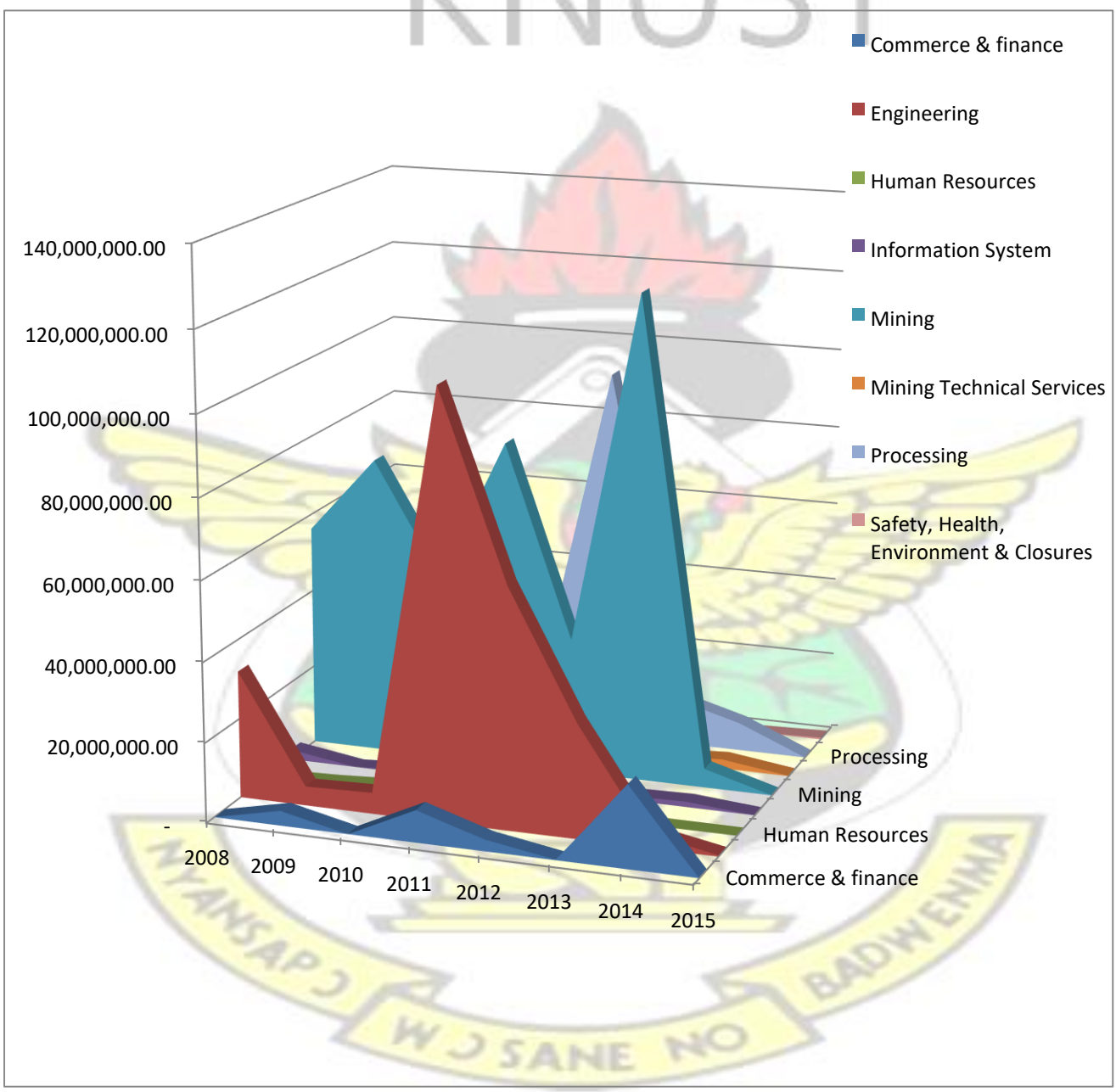


Figure 4.3b: Project Expenditure

Source: Field survey, 2015

From 2008 to mid – 2015, an overall expenditure of USD 941,491,365 was incurred for projects against an approved budget of USD 967,735,057 excluding contingency and USD 1,138,511,832 including contingency and management reserves. Contingencies are used for managing known risk whilst management reserves are used for managing unknown risk. The overall cost performance index was 0.95 which meant that for every dollar spent on a project, there was a 5 cent loss. The mean expenditure to completion for a project stood at USD 2,979,403.06 for an average project life cycle of two years.

Most projects were evidently directed towards ore reserve development, decline development, exploration drilling and mining infrastructure. A budget of USD 506,469,413 was approved for mining alone for the period under review against an expenditure of USD 422,797,989.

25.32% of the 316 projects overrun their approved budget including contingency and 44.30% also overrun their approved budget excluding contingency. 43.97% of projects that did not overrun had reduced about 33.82% of their original scope instead of alternate analysis or value engineering and whilst the remainder applied for an additional funds which were overwhelmingly in excess. The engineering area record the largest net overrun of USD 34,041,706 largely due to excessive gold plating of project implementation which led to scope creep and schedule slippage. 86.72% of these project slipped their baseline schedule beyond 6 months. This in no doubt affirms the cost/time relationship, time they say is money, the more a project delays, the more likely the cost will rise. The study also revealed that cost overrun s are not necessarily caused by the once off procurement of big ticket items but by the aggregation of small remote purchases.

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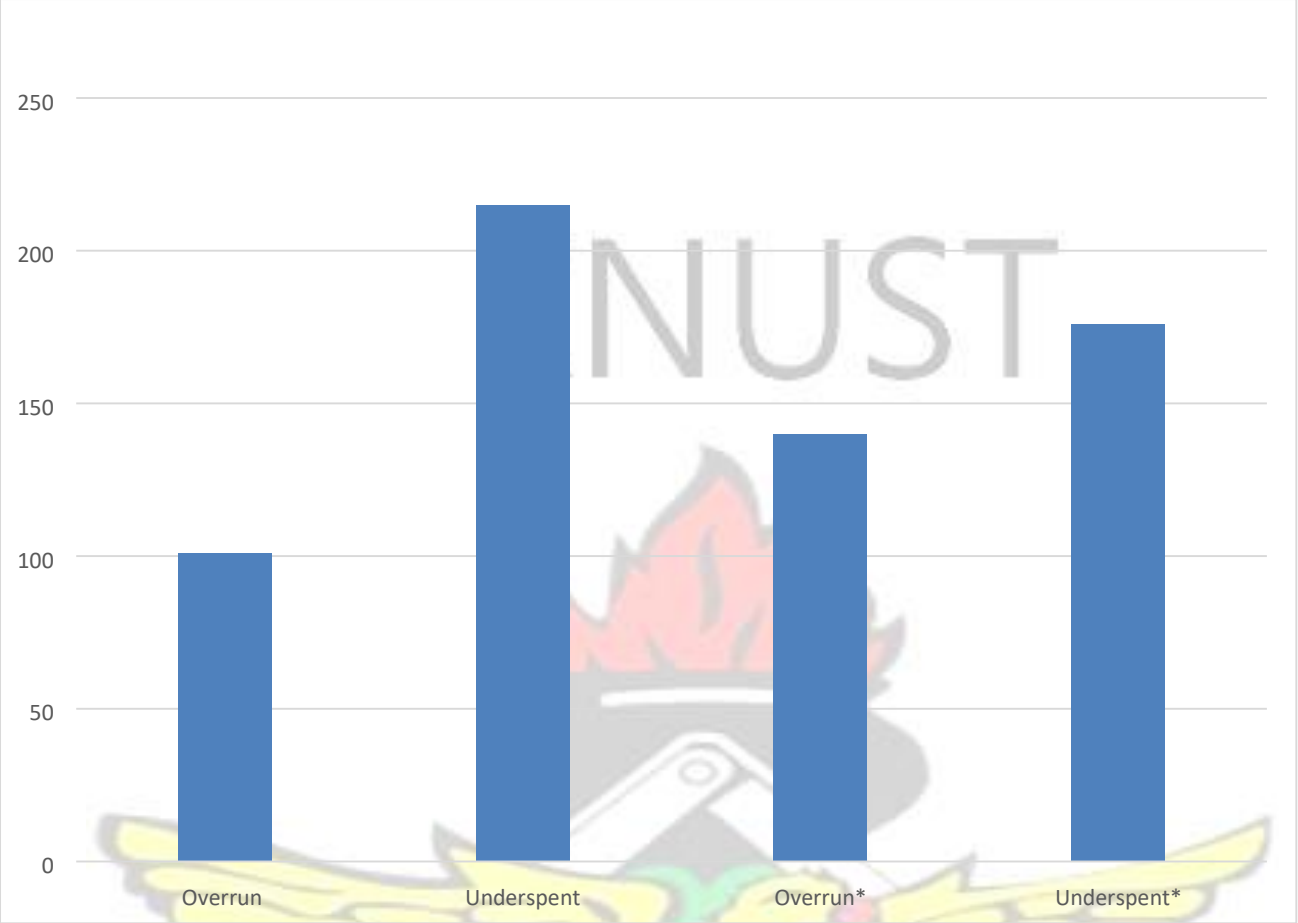

Figure 4.3C: Project Cost Performance

Source: Field survey, 2015

Table 4.2A: Distribution of Project Expenditure

Actual Spent	Area USD								
Year	Commerce & finance	Engineering	Human Resources	Information System	Mining	Mining Technical S	Processing	Safety, Health, Enviro	Grand Total
2008		32,050,847	327,420	2,534,811	56,274,082	3,329	11,522,871	18,866,803	121,580,163
2009	3,724,164	4,829,273	832,408		75,439,462		2,456,762	3,333,326	90,615,395
2010		5,317,456	1,776,836	975,768	46,909,350	91,135	9,174,377	2,823,542	67,068,464
2011	8,179,916	106,850,255	831,435	675,178	82,637,153	2,846,575	20,507,538	22,854,302	245,382,352
2012	2,971,626	60,345,206	120,002	1,109,758	34,291,903	13,798,381	94,871,934	1,148,462	208,657,272
2013	128,058	28,607,344	282,250	1,011,396	122,448,317	1,396,047	11,799,204	1,464,946	167,137,562
2014	20,886,636	3,607,869		1,360,324	4,797,722	2,367,553	7,143,129		40,163,233
2015		360,585				63,983		462,356	886,924
Grand Total	**35,890,400**	**241,968,835**	**4,170,351**	**7,667,235**	**422,797,989**	**20,567,003**	**157,475,815**	**50,953,737**	**941,491,365**

Source: AngloGold Ashanti Project & Feasibility Team

Table 4.2B: Distribution of Approved Project Budget

Approved Budget	Area USD								
Year	Commerce & finance	Engineering	Human Resources	Information System	Mining	Mining Technical Services	Processing	Safety, Health, Environm	Grand Total
2008		34,442,350	329,000	3,745,425	57,510,124	258,000	14,359,202	22,363,000	133,007,101
2009	15,656,000	5,371,696	1,102,000		99,739,751		3,489,600	4,176,762	129,535,809
2010		5,593,000	1,903,000	1,233,430	67,625,565	219,169	9,590,289	3,525,213	89,689,666

2011	15,656,000	80,777,372	1,097,220	721,000	97,715,076	1,108,000	34,714,662	30,621,081	262,410,411
2012	2,206,850	76,753,784	209,000	5,996,444	34,640,290	3,593,000	134,074,981	12,218,000	269,692,349
2013	131,000	33,178,101	1,885,000	2,793,740	143,100,334	1,711,941	13,261,696	6,753,000	202,814,812
2014	20,744,979	5,278,849		1,886,695	6,138,273	2,612,147	10,390,475		47,051,418
2015		3,225,000				341,237		744,029	4,310,266
Grand Total	**54,394,829**	**244,620,152**	**6,525,220**	**16,376,734**	**506,469,413**	**9,843,494**	**219,880,905**	**80,401,085**	**1,138,511,832**

Source: AngloGold Ashanti Project & Feasibility Team

Table 4.2C: Yearly Distribution of Real Cost of Work Performed

Earned Value Analysis	**Year**	**USD**							
Area	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**Grand Total**
Commerce & finance		12,368,240		12,368,240	1,743,412	103,490	16,388,533		42,971,915
Engineering	27,209,457	4,243,640	4,418,470	63,814,124	60,635,489	26,210,700	4,170,291	2,547,750	193,249,920
Human Resources	259,910	870,580	1,503,370	866,804	165,110	1,489,150			5,154,924
Information System	2,958,886		974,410	569,590	4,737,191	2,207,055	1,490,489		12,937,620
Mining	45,432,998	78,794,403	53,424,196	77,194,910	27,365,829	113,049,264	4,849,236		400,110,836
Mining Technical Services	203,820		173,144	875,320	2,838,470	1,352,433	2,063,596	269,577	7,776,360

Processing	11,343,770	2,756,784	7,576,328	27,424,583	105,919,235	10,476,740	8,208,475		173,705,915
Safety, Health, Environment & Closures	17,666,770	3,299,642	2,784,918	24,190,654	9,652,220	5,334,870		587,783	63,516,857
Grand Total	**105,075,610**	**102,333,289**	**70,854,836**	**207,304,225**	**213,056,956**	**160,223,701**	**37,170,620**	**3,405,110**	**899,424,347**

Source: Author's calculations, 2015

Table 4.2D: Variance Analysis

Variance.*	**Year**	**USD**							
Area	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**Grand Total**
Commerce & finance		9,583,436		5,127,684	- 1,095,804	- 16,708	- 3,253,404		10,345,204
Engineering	- 2,774,850	- 263,331	- 563,406	- 38,189,489	4,895,510	- 405,958	879,153	2,380,665	- 34,041,706
Human Resources	- 47,770	104,292	- 159,286	101,202	57,648	1,320,000			1,376,086
Information System	648,800		72,648	- 62,328	3,987,219	1,363,283	243,367		6,252,989
Mining	- 7,390,477	9,339,326	10,572,380	420,662	- 4,847,657	- 813,033	419,810		7,701,012
Mining Technical Services	215,971		95,159	- 1,904,775	- 10,744,331	59,103	- 147,228	226,068	- 12,200,033
Processing	682,451	509,398	- 1,022,631	8,999,925	19,091,800	- 526,762	1,688,775		29,422,954
Safety, Health, Environment & Closures	141,747	216,922	172,889	3,173,617	9,236,838	4,275,104		170,069	17,387,185
Grand Total	**- 8,524,127**	**19,490,043**	**9,167,752**	**- 22,333,503**	**20,581,225**	**5,255,028**	**- 169,528**	**2,776,802**	**26,243,692**

Source: Author's calculations, *2015*

The various contributing factors to project cost overrun can be summed up as inaccurate estimation and improper control (Frimpong et al, 2003). Time was also spent also by cost engineers building data instead of analysing them, which meant that timely informed decisions and interventions were delayed for effective feedback.

The participant again gave reasons why project objectives were not met during the period under review. The reasons are presented as follows

Table 4.3: Reasons that account for projects not meeting defined objectives

Reasons	Frequency	Percentage (%)
Regular change of project sponsor or strategy	3	6.12
Delays in payments of claims	2	4.08
Contracts team delaying the awards of contracts and procurement through bureaucratic processes	21	42.86
Not defining projects at initial stages and inaccurate cost estimation	13	26.53
Lack of project management skills	4	8.16
Inability of contractors to meet stated tasks deadlines	6	12.24
Total	**49**	**100**

Source: Field survey, 2015

From Table 4.3, 42.86% of the participants attributed 'Contracts team delaying the awards of contracts and procurement through bureaucratic processes' as factor that impeded projects from meeting their defined projects objectives. 26.53% also ascribed this phenomenon to

‘vague project definition and inaccurate estimation at the initiating phase of the project. Most project cost estimation were found to have either omitted an enormous scope or padded their budgets through creative estimation.

Other factors cited by participants also included the following: delay in the payments of invoices (4.02%); Inability of contractors to meet stated tasks deadlines (12.24%); lack of project management skills by project managers (8.16%) and regular changes of project sponsors and strategy (6.12%).

4.3 Project Cost Management Process in AGA, Obuasi mine.

The research question indicated in chapter 1 which drives this study sought to make an enquiry into project cost management processes at the AGA, Obuasi mine. Responding to this, the following concerns were considered: the existence of a project cost management process at the mine, whether the processes (if available) were always followed through and instances where the processes were violated.

Data gathered from the field survey shown that slightly above three-quarters (75.51%) of the participants indicated that there was a project cost management process and system in place. However, 18.37% and 6.12% percent respectively said that either there were no project cost management system in place or they were not aware of the existence of any project cost management processes on the mine. 24.49% is however, significant for personnel not be aware or state emphatically that they are no project cost controls in place and needs to be urgently addressed by senior management.

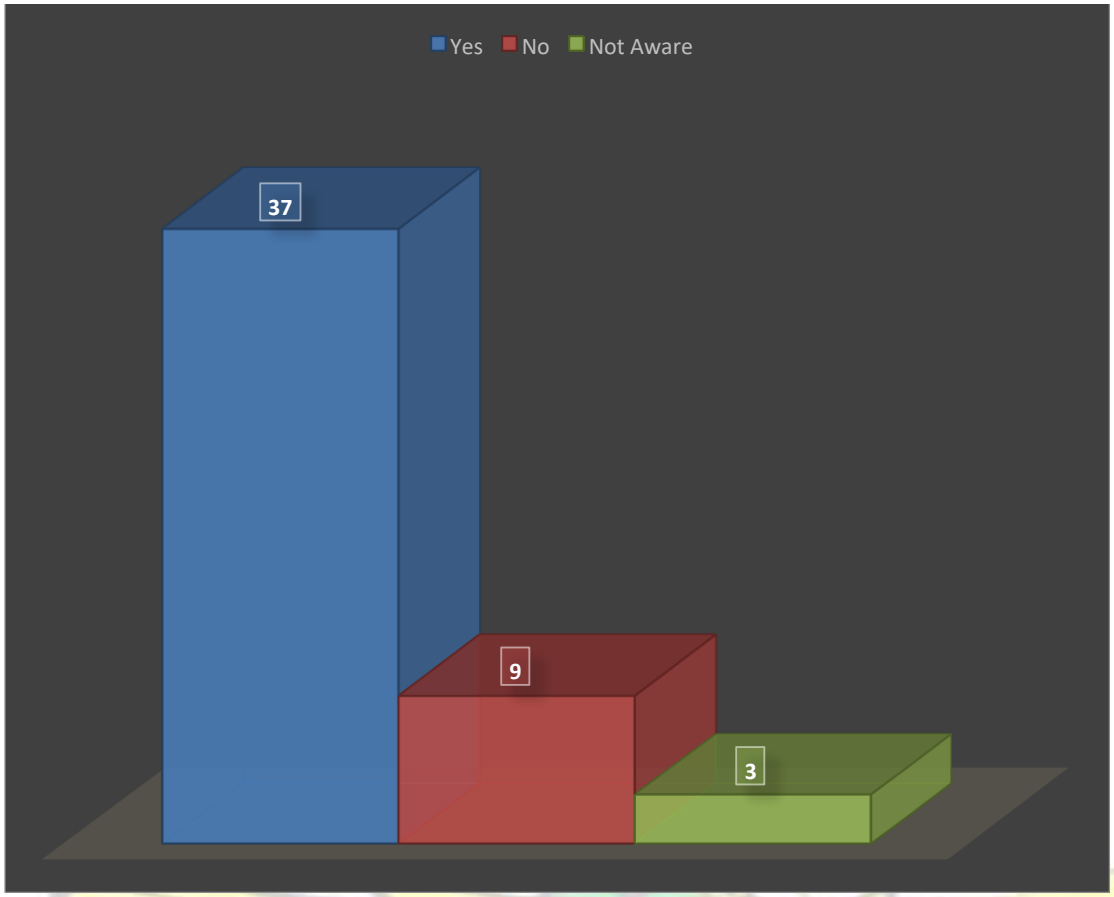

Figure 4.4: Awareness of project cost management processes

Source: Field survey, 2015

Though 75.51% of the participants established the existence of a project cost management process in mine, 59.18% of the participants believed that the existence of the project cost management processes did not mirrored the strict application of such processes when projects were undertaken. This suggests that, the projects management processes are not strictly adhered to during project implementation and does not speak well for the company since projects are not managed according to the set standard procedures. As a result, it has undesirably affected the delivery of projects.

Table 4.4: Major causes of changes in project cost management processes

Situation	Frequency	Percentage (%)
Rapid change of project managers	11	22.45
Delays in project duration	32	65.31
Improper management of project risks	6	12.24
Total	**49**	**100**

Source: Field survey, 2015

A reflection of the situations that give rise to changes in project cost management process at AGA, Obuasi is represented in Table 4.4. Close to two-thirds (65.31%) of the participants revealed that project cost management processes were not strictly adhered because of delays in projects durations. An inference could be drawn from the earlier responses by participants. 53.06% of participant indicated in an earlier question that project endeavors do not meet their project objectives especially, cost. It is however, implied that such occurrences, influence project delivery which are likely possible to result in the overrun of project budgets.

In addition, some section of participants also believed that rapid changes of project managers and unstable management' accounted for changes and violation of project cost management processes. This reason accounted for 22.45% of the overall reasons given. Lastly, 12.24% of participants attributed the changes and violations of the project cost management to the 'improper management of projects risks.'

4.4 Project cost variances and alternative techniques for continual improvement

The study was also interested in exploring the causes for variances in the project cost management and finding techniques to ideally manage such phenomena at AGA, Obuasi mine. In answering this research question, participants were requested to make known if there were variation in budgets when projects were undertaken. The result is presented in Figure 4.5.

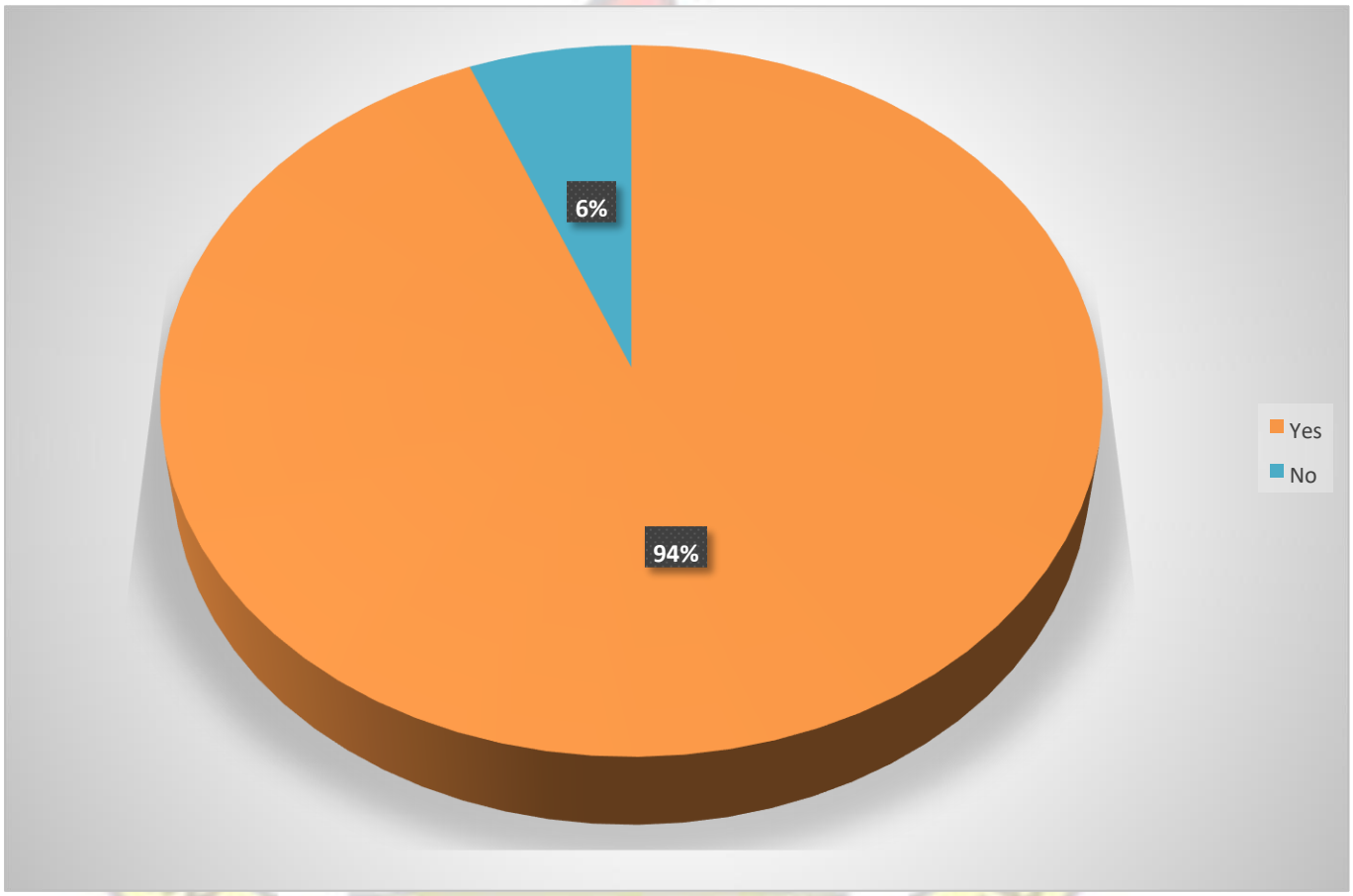

Figure 4.5: Project Cost Variances

Source: Field survey, 2015

From Figure 4.4, a vast number (93.88%) of the participants stated that there were variances when projects are undertaken whilst the remaining 6.12% opposed the notion. Participants further cited the sources of project cost variations. This is depicted in Figure 4.6.

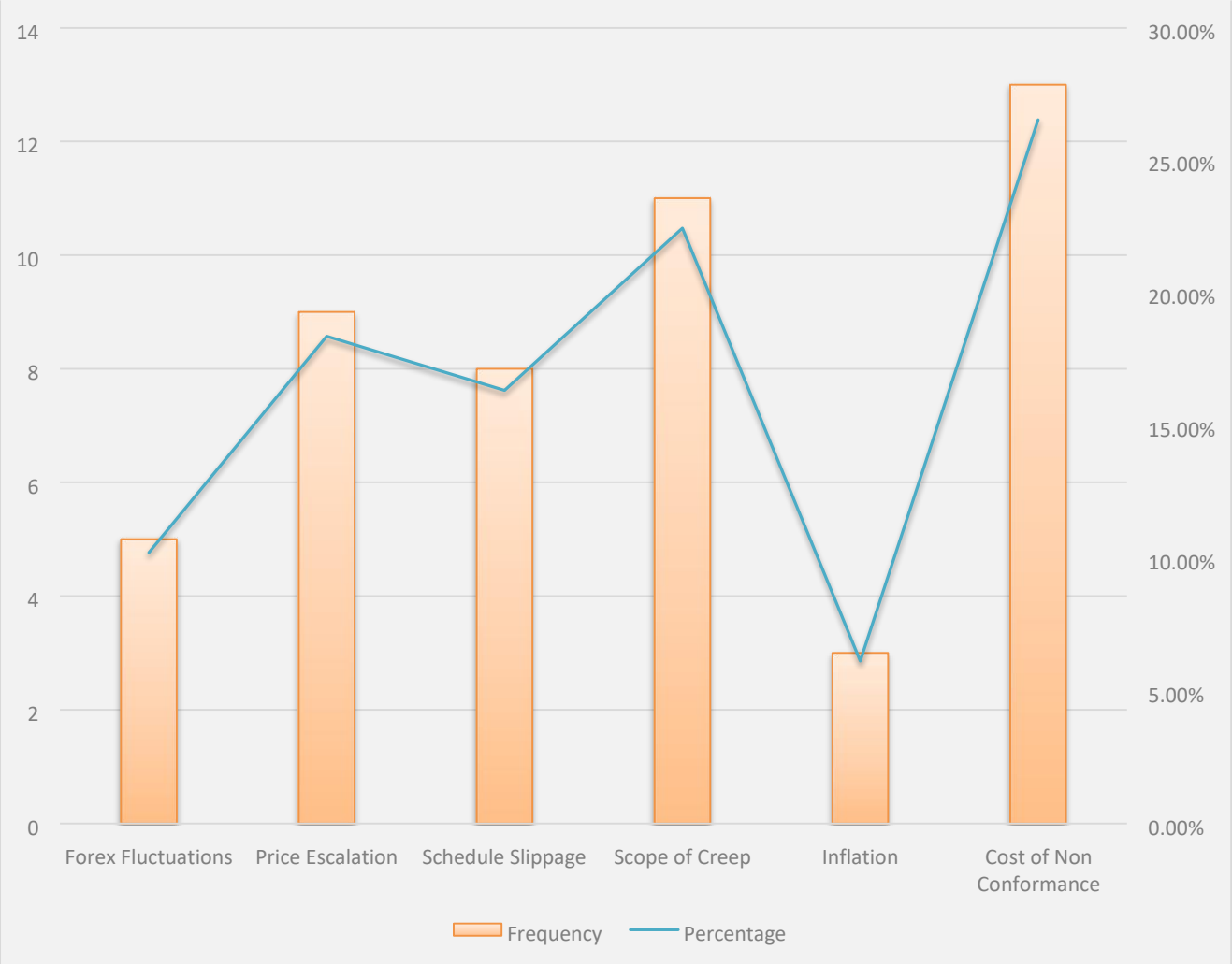

Figure 4.6: Sources of project cost variances

Source: Field survey, 2015

Variances from project cost emanates from the following sources: forex fluctuations, price escalations, schedule slippage, scope creep, inflation and cost of non-conformance. Cost of non-conformance which is normally associated with rework and scrapping accounted for 26.53% of all variations identified by participants. This is as a result a result of the projects not meeting the required engineering standard and specification. 46.91% indicated that they impacted on schedule and may lead to cost overruns.

Scope creep was also contributed to 22.45% of project cost variation largely as a result of unapproved additional site works that gets done before the site instruction and contract variation order are approved.

Other sources according to the participant included the following; price escalation (18.37%), schedule slippage (16.33%), forex fluctuation (10.20%), and lastly inflation (6.12%)

Table 4.5: Alternative ways of minimizing project cost deviations

Resolving with project cost variances	**Frequency**	**Percentage (%)**
Proper planning and scheduling	8	16.33
Organization and personnel	3	6.12
Procurement	5	10.20
Delivery	4	8.16
Quality Assurance / Quality Control	6	12.24
Integration of Cost Management Tools	7	14.29
Accurate estimations	16	32.65
Total	**49**	**100**

Source: Field survey, 2015

From Table 4.5 above, participants affirmed the researcher's expectation that the basis of any efficient and effective cost management system relied to a large extent on the basis of estimation. Participants' suggestions were classified into the categories in the table above.

Some of the solutions, they provides were as follow;

- Accurate task sequencing and methodology for performance task
- Preparation of accurate and detailed cost estimates from bottom up approach
- Routine evaluation of all processes and procedural systems to adjust to project cost management processes
- Conducting proper recruitment of qualified personnel, developing and training them, and equipping them to be more efficient and productive
- All contract clauses must be clearly and unambiguously stipulated and must include penalties for the non-conformance or breach
- Delivery choice should be determined based on budget requirements Regularly inspection and assessment of project deliverables

4.5 Difficulties in the cost management of mining investment project

The last question on the questionnaire focused on investigating the difficulties associated with managing project cost at AGA, Obuasi mine and the probable solutions and best practices to addressing such difficulties. In conformance to the research objective, participant were required to give out some of the difficulties in project cost management of projects. Their feedbacks were classified into five major categories as shown in Table 4.6.

According to Table 4.6, almost of half (46.94%) of the participants identified Bureaucratic processes and procedures as the most challenging factor with regard to project cost management. This is likely to have negative effects for projects to meet their budget requirements.

Table 4.6: Difficulties in Project Cost Management

Difficulty	Frequency	Percentage (%)
Bureaucratic processes and procedures	23	46.94
Lack of report on projects by project managers	13	26.53
Rapid change in management	8	16.33
Organizational Politics	5	10.20
Total	**49**	**100**

Source: Field survey, 2015

In addition to challenges related to bureaucratic processes and procedures, 26.53% of the participant identified 'lack of report on projects by project managers' as another difficulty in project cost management. This may perhaps be inferred from the fact that some project engineers and managers lack the basic expertise for management by exception reporting. 16.33% of the participants cited rapid in changes in management as a difficulty in managing project cost. This can pose a challenge, especially when projects are not well documented to continuity in cases where senior managers are substituted, transferred or resigns.

Last but not the least, 10.20% of the participants cited organizational politics and interferences, and conflict of interest as a difficult in project cost management. This emanated personal selfish interest and fraudulent behavior, and boot licking of some of both project sponsors, managers

and engineers. Nonetheless, majority of the participants were of the opinion that project cost could be effectively controlled and optimized.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This is the last chapter of the whole research. It gives a summary of the findings and implication of the results for the study, recommendations drawn from the summary as well as an overall conclusion. Finally, recommendation for further research is given.

5.1 Summary of findings

The main objective of the study was to evaluate the project cost management at AngloGold Ashanti – Obuasi mine. Unambiguously, the study focused on the assessment of whether projects on the mine were effectively and efficiently managed to meet their objectives in terms of scope, time and cost; investigate the project cost management processes at AGA, Obuasi mine; explore the reasons for variance if any and alternative approach to ideally managing project cost on the Obuasi mine and as a final point, to find out the difficulties associated with project cost management in a mining environment, in this scenario AngloGold Ashanti Ghana Limited – Obuasi Mine.

Data was gathered from 49 employees and the lead cost engineer with the help of questionnaires and interview schedule respectively. Descriptive statistics in the form of tables, bar graphs and pie charts were used to describe the data. The key findings which emanated from the study revealed the following:

The field findings pointed out that a vast number (93.88%) of the participants answered in the affirmative to confirm that projects had indeed specified goals whilst only 6.12% replied that projects undertaken in AGA, Obuasi mine had no objectives.

Historical data pulled from various 316 projects from 2008 to 2015 also proved this contention of projects not meeting the projects objective of cost, as answered by participants. From 2008 to mid – 2015, an overall expenditure of USD 941,491,365 was incurred for projects against an approved budget of USD 967,735,057 excluding contingency and USD 1,138,511,832 including contingency and management reserves. Contingencies are used for managing known risk whilst management reserves are used for managing unknown risk. The overall cost performance index was 0.95 which meant that for every dollar spent on a project, there was a 5 cent loss. The mean expenditure to completion for a project stood at USD 2,979,403.06 for an average project life cycle of two years.

The various contributing factors to project cost overrun can be summed up as inaccurate estimation and improper control (Frimpong et al, 2003). Time was also spent also by cost engineers building data instead of analysis them, which meant that timely informed decisions and interventions were delayed for effective feedback.

Variances from project cost emanates from the following sources: forex fluctuations, price escalation, schedule slippage, scope creep, inflation and cost of non-conformance.

Management by exception was given as a control on project cost variances. Almost half (46.94%) of the participants identified Bureaucratic processes and procedures as the most challenging factor with regard to project cost management. Nonetheless, majority of the participants were of the opinion that project cost could be effectively controlled and optimized.

5.2 Conclusion

Project cost management involves all the tasks, systems and resources channeled towards estimating, budgeting, planning, monitoring and its associated preventive and corrective mechanisms to accomplish investment and operational strategic objectives. With AngloGold Ashanti (GH) Limited, Obuasi mine halting its operations and soon to fully enter into a project implementation phase, the study looked into its previous project cost management practices.

With the findings in the review and evaluation of project cost management mechanisms in project control, a gross disregard and breach of project cost management processes was revealed right from project initiation to project completion or termination. The abuse of variation orders, change of scope, contract contingency, management reserves and project contingency were also revealed. This hindered project cost controlling and an enormous task tracking fraudulent project transactions.

Although, the probability of error can never be reduced to zero as estimation may involve some level of personal value judgement and hence not an exact science but reliable cost estimates should form the basis of proper cost management controls. Project cost management also depends to a large extent on monitoring and controlling the various contractors and sub-contractors. More attention should be paid to variable direct cost as a means of controlling cost overruns. Value engineering and project resources alternative analysis is a more ideal in cost control which takes cognizance of project cost drivers.

Unless accounting and cost control systems are flawed, the actual amount spent on a project and its definitive project cost estimate should converge when all scoped and scheduled activities are completed, all other things being equal.

The evaluation technique used a well-experienced and long-established mining firm, thereby, making a strong case for the research findings. Preventive cost overrun mechanisms should be adopted instead of corrective measures as it puts in place checks and balance to avoid overruns.

Further research across the various mining industry in Africa is needed to confirm and validate the findings of the study as small sample size was used for the study.

5.3 Recommendations

Based on the major observations emanating from the research, the research recommends the following techniques to enhance project cost management at AngloGold Ashanti - Obuasi Mine:

Adherence to project cost management systems should be strictly enforced by management. This will go a long way in making sure that the objectives set in the management policy on capital projects are met.

Value engineering and alternative analysis should be adopted and used as a means of meeting project budget constraints rather than eliminating some scoped activities or tasks.

The integration of project cost management software and other software on the mine should be developed and utilized to avoid manual entry of data which will establish a cost database data warehouse. This will aid in reducing reporting cycles and increase credibility and confidence in the face of shareholders.

Fixed sum contracts should be awarded instead of cost plus margin and incentives. This may be liken derivatives markets which locks price as a measure against price risk. In addition to the above recommendation, it is also recommended that management should abide and remain unflinchingly obliged to approved contracts, provide accurate budget for contracts as well as ensuring that funds for projects are made available. Project supervisors/schedulers monitoring projects should be given letters of authority and made known to contractors while projects managers, as much as possible, should be maintained throughout the project lifecycle. All these are aimed at curtailing cost, quality, scope and schedule variations.

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APPENDICES

Appendix 1

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

COLLEGE OF ART AND SOCIAL SCIENCES

KNUST SCHOOL OF BUSINESS

DEPARTMENT OF ACCOUNTING AND FINANCE

QUESTIONNAIRE

This survey seeks to evaluate Project Cost Management in the Mining Industry using AngloGold Ashanti – Obuasi Mine as a case study. The study is in partial fulfilment of the requirements for the award of an MBA - Finance in KNUST.

I should be most appreciative if you could provide answers to the questions below. All information provided would not be disclosed in the public as it is purely an academic endeavor.

QUESTIONNAIRES FOR ANGLOGOLD ASHANTI PROJECT AND FEASIBILITY TEAM MEMBERS

Please tick the appropriate box

1. Personal Data

1. Name of respondent: ..... (Optional)
2. Age of respondent: less than 30 [ ] 30- 45 [ ] 46-60 [ ]
3. Gender: Male [ ] Female [ ]
4. Educational status : Academic [ ] Professional [ ]
5. Section: Project Capital Management [ ]
   Project Planning/Scheduling [ ]
   Project Cost Management [ ]
   Project Claims Management [ ]

Project Implementation [ ]

2. Are Projects Objectives At AngloGold Ashanti Obuasi-Mine Met In Terms Of Cost?

1. Does the projects undertaken in your department have a define scope, time and cost objective?

   Yes [ ] No [ ]

2. Does the projects undertaken in your department meets their defined cost objective?

   Yes [ ] No [ ]

3. If No, explain why

   ……

   ……

   ……

3. What are the project cost management processes at the mine?

1. Is there a project management process in your company?

   Yes [ ] No [ ] Not Aware [ ]

2. Are the project cost management processes always followed through during project delivery?

   Yes [ ] No [ ]

3. If no, what are some of the instances when the processes are breached

   ……

   ……

   ……

4. **What are the project cost variances and alternative ways for improvement?**

1. Are there variances when projects are undertaking?

   Yes [ ] No [ ]

2. If yes, what are some of the variances?

   ……..…

   ……..

3. Do these variances affect the project?

   Yes [ ] No [ ]

4. What are some of the alternative ways of cost improvement?

   ……

   ……

5. **What are the challenges of project cost management in the mine?**

1. What are some of the challenges of project cost management on the mine?

   ……

   ……

2. Are there any possibilities of reducing these challenges?

   Yes [ ] No [ ]

3. What are the possible ways of reducing these challenges?

   ……

   ……

THANK YOU!

INTERVIEWS WITH PROECT MANAGEMENT AND FEASIBILITY TEAM MEMBERS OF ANGLOGOLD ASHANTI (GH) LIMITED - OBUASI MINE

This survey seeks to evaluate Project Cost Management in the Mining Industry using AngloGold Ashanti – Obuasi Mine as a case study. The study is in partial fulfillment of the requirements for the award of an MBA-Finance in KNUST.

I should be most appreciative if you could provide answers to the questions below. All information provided would not be disclosed in the public domain as it is purely an academic endeavor.

1. Personal Information

1. Name of respondent:…..(Optional)

2. Role:.....

3. Section:.....

2. Challenges in project cost management

What are some of the challenges that have been encountered in the management of project cost over the years on the mine?

.....

.....

.....

What are your suggestions to the better management of project cost on the mine?

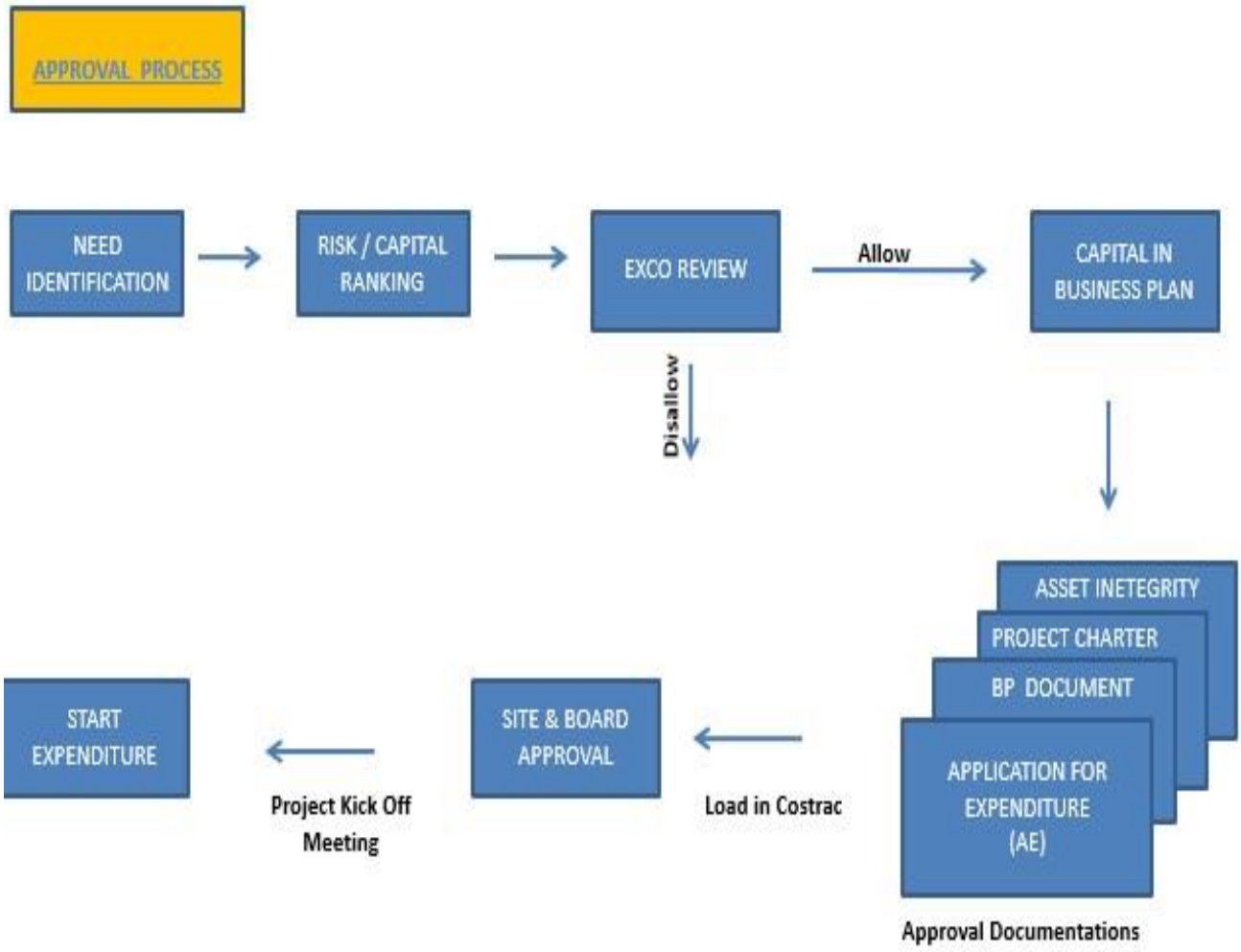
.....

.....

.....

THANK YOU!

Appendix 2:



Investment Project Approval

APPENDIX

POST COMPLETION AUDIT
Project Post Completion Audit (PCA)

PRE START AUDIT PARAMETERS / INDICATORS (to be completed at AE stage)

PROJECT TITLE:	
OBJECTIVE:	
BUDGET:	
AE Ref. No.	
PLANNED START DATE:	
PLANNED FINISH DATE:	
% WITHIN BUDGET:	
% WITHIN TIME:	
% WITHIN QUALITY:	
RETURNS:	

ATTACH LIST OF ASSETS (if necessary)

Name: Signature: Date:

POST COMPLETION AUDIT (to be completed at commissioning)

	ORIGINAL	REVISED	FINAL	% VAR
OBJECTIVE				
PROJECT SCHEDULE Start Date Completion Date				
PROJECT COST Capital Expenditure Contingency Escalation				
Total				
QUALITY				
INVESTMENT Returns IRR NPV Payback				

BRIEF OVERVIEW

Name: Signature: Date:

Project Post Completion Audit