SACQSP 2015 - 069

Cost variance analysis of similar scope projects in an energy utility.

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ABSTRACT

Purpose
This paper reports on the findings of a cost analysis exercise conducted on projects of similar scope in various divisions within the energy utility. The absence of a well-established effective system of monitoring and controlling cost of projects has caused strong levels of dissatisfaction to the customers of the energy utility. Customers receive similar product but too often different in terms of cost comparison with various internal divisions of the same business and this has resulted in customers having a different perspective about the energy utility specifically when it comes to the management of funds. This study was therefore carried out using electrical feeder bay projects of same voltage capacity which are built to supply major customers of the business such as mines and large industries which require high consumption of electricity.

Design
Meetings with experts, one on one interview with some project team members about how projects were being managed, these were the main methods used to collect data used for this study and this had to include searching through the repository system that the business is using to keep projects information. The approach of the study was both quantitative and qualitative in nature thus it drilled down into scope details and costs.

Findings
It was found that 132kV feeder bay projects of similar scope are having different cost expenditures and this had to be looked at comprehensively to help the business with facts in order to understand this situation and take lessons and corrective decisions.

Key words: Cost Management, Cost Control, Feeder Bays, Earned Value Analysis.

1. INTRODUCTION

This study indicates that projects of similar scope were having different cost expenditures. This cost analysis study has received much attention in the business due to obvious reasons which are basically saying how can customers buy same product from one business but different in prices? The amount of effort invested by the team delegated in this exercise was enormous to drill most of the useful information and also managed to draw lessons learnt in the process. Considering the challenging economic times we live in, one project management corner of the triangle that has become more sensitive and needs greater attention is cost management. It has become very imperative to understand how each rand and cent is accounted for as the project is going on. This exercise was conducted on some completed and commissioned projects of the period between the year 2011 and 2014. The selected projects used in this study also indicate that the expenditure of most of them was above the original budget allocated. This study reveals that some elements of cost management were not considered to measure progress of these projects. It was noted on various literature review that the commonly used systems for monitoring and controlling project costs are: cost value reconciliation, detailed spread sheet model and earned value analysis system (EVAS). It was also indicated that the effectiveness of the monitoring systems in showing deviations of project performance varies considerably from one system to another. Some systems are more effective in indicating the need for control action than others. It was identified that EVAS gives more detailed indication of the overall project performance even though this system was not used effectively in the projects reviewed. Lack of usage of this effective system was attributed to lack of technical personnel to apply it. The study also indicates that the loading of resources in these projects was not done properly. The main focus of the study was to analyse why projects of the same scope in terms of technical functionality and size could spend different amount of costs in various divisions yet the same business. The analysis identified four cost elements namely Labour, Civils, Stringing and Equipment. Projects executed in various three divisions of the business were spending differently in all the cost elements identified as contributors of the cost variances.

2. AIMS AND OBJECTIVES OF THE STUDY

The purpose of the study was to conduct the cost variance analysis and to gather lessons learnt from the cost discrepancies with an intention of recording them in the project repository system of the business and share them amongst the old and new project managers and their supporting teams so that identified areas of weaknesses may not be repeated in future projects. The main idea is to create a reliable knowledge base that project team members will refer to with an aim of continuous improvement in implementing projects. The business may also have to take a decision whether to dedicate this type of projects to one division considered more efficient amongst others. The following areas were used to analyse the causes of cost variances:

The following project cost elements will be analysed:

- Labour: Identifying how resources are loaded which has an impact on labour cost recovery.

- Civil contracts: principles relating to procurement of civil contractors
- Equipment: analyse if different suppliers are resulting to different in costs of purchasing.
- Stringing contracts: principles relating to procurement of stringing contractors.

In terms of the classification of costs elements all of the above falls under direct costs of the project and can therefore be controlled by the project manager.

3. METHODOLOGY

To better understand the causes of the costs variances on similar projects, a team consisting of various specialists was established to help bring on table technical facts that resulted in cost discrepancies. The repository systems of the business were opened to see if some project information could still be available to be perused for this analysis. The analysis team were given various tasks to complete this exercise and that included but not limited to performance against the project schedule, designs and actual costs of the project against the estimate. The analysis team then formed various focus groups which were tasked to report back on the specific feedback expected. Various focus groups came back to report on their subject matter and the reports were then saved in a new repository system which is created for the purpose of this study. Minutes of all the discussions from various focus groups were taken and filed together with the reports in order to produce a preliminary report which was critically looked at by the full team to see if it is ready for submission and amend any other information which they feel was not captured accurately.
An additional survey with specific questions was developed and sent to other project managers who are not part of this exercise and they circulated the surveys to their teams to capture the views about cost overruns and inconsistencies of cost expenditures on projects of similar scopes. The feedback of the survey was collected and together with the report from an analysis team, one document was compiled and sent to senior managers of the affected divisions and they were given an opportunity to provide inputs related to the cost discrepancies of these similar scope projects. A final document was then compiled and named costs analysis report of 132kV Feeder Bay projects.

Projects analysed: Figure 1

Transmission Projects	Province	Group Capital Projects	Province	Distribution Projects	Province
1. Tabor Botlokwa 132kV Feeder	LP	1. Aurora 132kV Feeder	WC	1. Hotazel new 132kV Feeder	WC
2. Ingangane Wyskom 132kV Feeder	KZN	2. Grassridge 132kV Feeder	EC	2. Leeuwbosch 132kV Feeder	WC
3. Umfolozi Ncwane 132kV Feeder	KZN	3. Juno 132kV Feeder	WC	3. Windmill 132kV Feeder	WC
4. Incandu Madadeni 132kV Feeder	KZN	4. Witkop 132kV Feeder	LP	4. Blanco 132kV Feeder	WC
5. Acacia MTS 132kV Feeder	WC	5. Poseiodon 132kV Feeder	EC	5. Paleishuwel 132kV Feeder	WC

Source: Internal Company Costs Database, SAP

4. LITERATURE REVIEW

Dynamics of projects require proper attention to be given to all aspects of the projects. As projects grow in size and complexity, the ability to plan, monitor and control them has become a key project management function. Like any other business, project managers have to plan and organise their day to day activities in order to manage effectively. Monitoring and controlling are universal activities indispensable to effective and efficient operation of the control cycle. According to Al-Jibouri (2003), within construction, divergences from the original plan will occur; as a result every project should have a control cycle (shown in Figure1) in order to complete within the planned budget and also adhere to the planned completion time and please all stakeholders and clients involved.

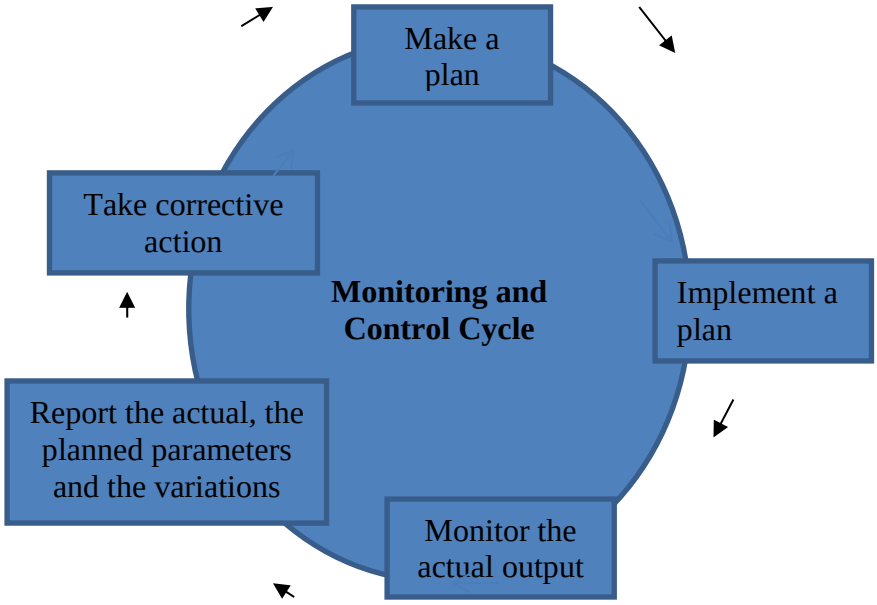

Figure 2: Control Circle
Source: Aljibouri, S.H; 2003

During the execution of a project, procedures for project control and record keeping become indispensable tools for project managers and other participants in the construction process. These tools service the dual purpose of recording all financial transactions that are happening in a project together with informing managers and stakeholders of the progress and challenges that are being experienced in a project. The task of project monitoring and control is to give a fair indication of the existence and extent of problems associated with the project. For monitoring and control purposes, the original detailed cost estimate is typically converted to be a budget of the project and the project budget becomes a guide for management. Expenses incurred during the course of the project are recorded in specific job accounts to be compared with original cost estimate in each category. Thus, individual job accounts generally represent the basic unit for cost control.

Most of the project budget is consumed during the construction process. Therefore it is the prime responsibility of the project manager to control the costs associated with the work packages. A project cost can usually be classified as direct, indirect and overhead costs. During the budgeting process all these costs are sum up to develop a cost baseline. A

cost baseline is defined as cumulative time-phased budget that will be used to measure and monitor the current and future project cost performance. It is graphically represented in a form of S-Curve and it is an important cost monitoring tool. It allows the user to see the project cash flows over the period of time and allows them to forecast the trends of future spending. S-Curve defines the amount of construction spending according to the budget allocation (Neale and Neale, 1989). It is a convenient tool for cost management. It can produce different cost scenarios that will make it possible for the manager to envisage future spending trends (Kern and Formoso, 2004). Below is an example of typical S-Curve that is based on cumulative values of cost estimate.

Figure 3 below indicates how the projects perform in terms of the actual expenditure against the budget.

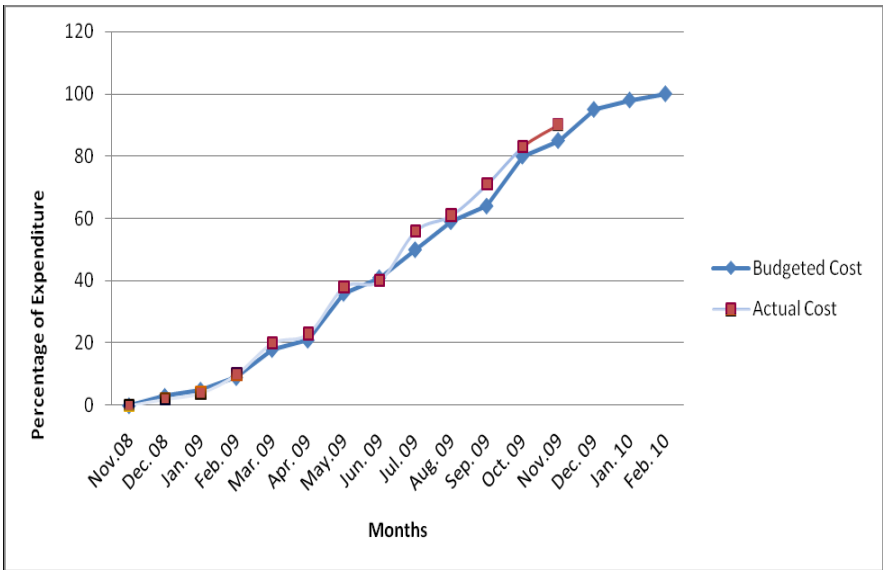

Figure 3: An Illustration of Budgeted vs. Actual Costs
Source: Oxley & Poskitt, 1996

In these customary approaches, usually separate and direct monitoring is used for time and cost analysis. Kenley (2003) described the direct monitoring techniques for time and cost management in construction projects. Indirect monitoring there is split up between the time and cost performance indicators. Both of them are measured and reported in isolation with each other by comparing their planned and actual values at stipulated time frames. The direct monitoring does not point out anything about what has actually been produced at the rate or according to the schedule, originally planned. In other words, it does not relate the time versus cost performance of the project (Kenley, 2003). An effective project performance control cannot be achieved only by monitoring the actual physical progress with the planned progress and actual spending with the budgeted values (Ahuja et al, 1994). This approach maybe deceptive as it does not take in consideration the worth of the work which is completed in a particular period. The cost performance graph (Figure 2) shown suggests the comparison between budget and actuals. It does not point out any information about how much work has been done against the expenditure. This aspect may limit the scope of traditional cost monitoring as it does not address the complete depiction of the project current as well as future progress trends in a true manner. Therefore, because of these limitations, was the introduction of Earned Value Analysis System. EVAS gives more

detailed indication of the overall project performance than any other system. The traditional approach of project performance measurement usually separates the time and cost parameters during the progress reporting. Nevertheless EVAS integrates time and cost functions and allows the project manager to see a clear insight of project performance with an open eye. It proves the earned value of completed work and compares it with actual cost and planned cost to determine the project performance and forecast its future trends.

Figure 4 below shows how Earned Value Analysis is used to measure project performance and progress

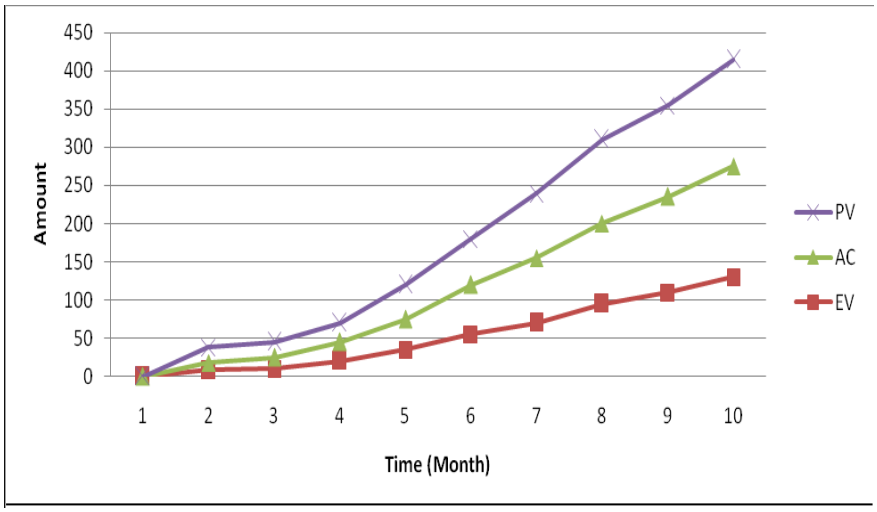

Figure 4: An Illustration of PV, EV and AC
Source: Oxley and Poskitt 1996

4.2 Purpose of project cost monitoring and controlling

The purpose of project cost monitoring and controlling is to allow the project to be completed within the approved budget. According to Oxley and Poskitt, (1996; pp 164), the primary aim of cost control system is to:

- Ensure that money is not wasted and destabilise both the client and the contractor in the process to a level of abandoning the project incomplete.
- Ensure that the project is carried out within budget.
- Arrive at the cost of each operation as planned and carry out a continuous comparison with the target to ascertain the project performance.
- Provide cost information to assist in future estimating work.

4.3 Project cost monitoring and control system in demonstration

Al-Jibouri (2003) described activity based ratio as financial control technique that employs the ratios between the earnings and the expenditures of the activities as measures of performance. The system can also be used to measure the performance of the whole project as well as that of the activities. The three ratios the system relies on for the calculation of performances are:

- Planned performance = Planned Earnings

  Planned Expenditures

- Actual Performance = Actual Earnings / Actual Expenditure

- Efficiency = Actual Performance / Planned Performance

The ratios can be calculated at any time and over any duration for which the plan is available. Both planned and actual work must be evaluated using the same rates for earnings and the same rate for expenditure. If the earning rates come from the original estimates, the performance measures calculated above give an evaluation of the performance against the estimate and the efficiency gives a measure of the project performance against the plan. The measures used by this technique are both simple to calculate and simple to interpret. They require relatively little data and can be applied at a range of level in a project. They can for example be prepared for a whole project or a section of it can therefore be used in measuring contributions of the teams involved. Based on the above, it can be concluded that the measures used to control costs for the projects under analysis were not good enough to help the business to benchmark the projects costs with other similar projects.

5. FINDINGS ON COST VARIANCES ON SIMILAR SCOPE PROJECTS

The projects analysed had cost variances that are not justifiable but could at least be grouped in certain categories which are as follows:

- Labour Costs

The costs of labour in this case refers to various teams including but not limited to substation designers, project management, commissioning team and many others. It has been noticed that these costs differed from the three divisions and their projects.

- Civil Works Contracts

The Civil contracts refer to the appointed contractors who will build the foundations of all substation equipment. The exercised revealed that the civil costs were different with high margins that need a serious attention so as to find all the facts that causes variances on projects of all three divisions.

- Stringing and Cabling Contracts

This refers to the contractors appointed to do all cabling and conductors work together with all the settings that would result in all electrical apparatus functioning as intended to for electricity supply.

- Equipment Cost.

The equipment used in all these three divisions should in principle be the same however it was found by this exercise that the cost of equipment still come out different among divisions.

Divisions involved on cost comparison exercise:

- Group Capital,
- Transmission and
- Distribution

6. ACTUAL COST COMPARISONS

Table 1 and Figure 4 show the actual costs incurred in divisions.

Table 1: Actual Cost Comparison between Divisions (Costs in R.M)

Divisions	Civils	Equipment	Labour	Stringing	Grand Total
Distribution	0.5	1.5	1	0.5	**3.5**
Group Capital	2.5	2.5	3	2	**10**
Transmission	1.5	2.5	2	0.5	**6.5**

Source: Internal Company Costs Database, SAP

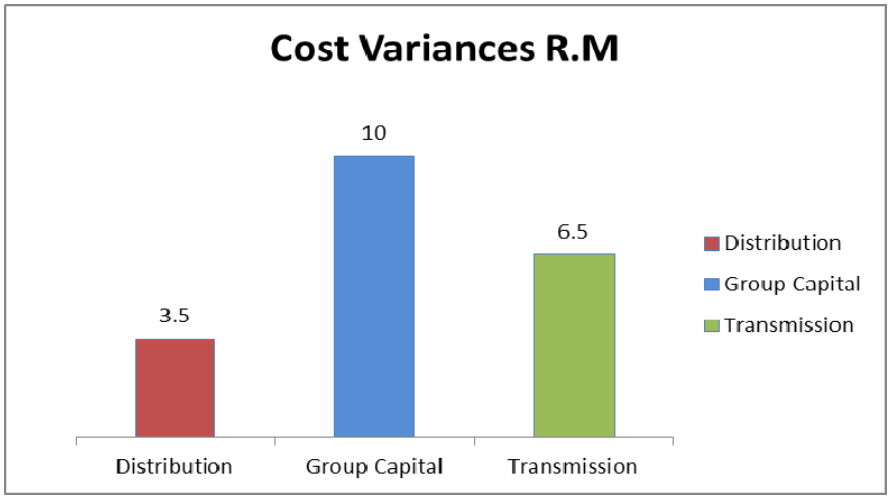

Figure 5: Graphs of Cost Comparison.
Source: Internal Company Costs Database, SAP

7 ANALYSIS OF COST VARIANCES

7.1 Group Capital Division

7.1.1 Labour Costs

This division uses more consultants who are fully dedicated in one project per time and they will under no circumstances be involved in more than one project in functions such as project management, SHEQ, QS, Civil Engineers, Site Supervisors, and Environmental Specialists thus spending more in Labour costs compared to other two business divisions. The team recovers costs for all the hours they spend in a project full time.

7.1.2 Equipment Costs

- The equipment required for this division are similar as other two divisions and the division uses only newly bought equipment and will under no circumstances reuse old equipment.

7.1.3 Civil Costs and Stringing/Cabling Works

- This division uses the business internal contractors with a principle of first right of refusal. Internally established contractors are expensive as compared to open tender contractors and this is because internal contractors are not limited by policy in terms of how much work should be subcontracted.

7.2 Transmission Division

7.2.1 Labour Costs

- This division uses full time employees who are paid by the business and they do get involved in various projects at the same time thus recovering only up to eighty percent of hours spent in a project.
- This division does not use external consultants because they have enough internal capacity.

7.2.2 Equipment Costs

- The equipment required for this division are similar as other two divisions and the division uses only newly bought equipment and will under no circumstances reuse old equipment.

7.2.3 Civil Costs and Stringing/Cabling Works

- This division normally goes out to open tender and has policies that limit the amount of work which should be subcontracted thereby saving cost compared to the previous division.

7.3 Distribution Division

7.3.1 Labour Costs

- This division uses only junior staff in running the projects therefore no senior engineer or manager can recover the hours worked in any project.
- The division reserves a 5% for Labour costs (Project Management, Engineering etc.) in all their projects and will never spend more that under any circumstances. This is normally determined before the project starts and the funds will be apportioned accordingly.

7.3.2 Equipment Costs

- In this division old equipment that was removed from other projects can be reused as opposed to the other two divisions thus saving costs from buying most new equipment.
- In this section of the business equipment are bought in bulk in advance not for a specific project thus saving costs of escalation.

7.3.3 Civil Works and Stringing/Cabling works

- This division uses a principle called localisation when it comes to procurement of contractors whereas the other two divisions use a global approach which accommodates all contractors in the country. Distribution saves costs of preliminaries and generals due to distance.

8 CONCLUSIONS

It has been established that the three divisions are spending differently to execute similar scope projects. The same 132kV Feeder Bay projects are having strong cost variances when it comes to actual costs at the end of the project. The business has different policies amongst divisions hence there are various inconsistencies when it comes to the methods of project management. The findings obtained in the study conducted will assist the business in reconsidering the various policies and principles used in three divisions of the business.

9. RECCOMMENDATIONS

The lessons learnt in this study should be implemented to avoid discrepancies of the same nature. This must be recorded in the project information system of the business for future reference. It is important for project managers to make reference of the previous related work before they start their new projects. Project cost is part of the three areas that make up a project triangle and therefore extremely important

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