

An Evaluation of Cost Performance of Public Projects: Case of Botswana

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Abstract

Improving cost performance of public projects, still remains one of the challenges facing the construction industry in developing countries. Research has found that there are many cases of cost overruns as compared to projects that have been completed within budget. This paper seeks to evaluate the cost performance of public projects in Botswana, and tries to identify factors that influence construction cost overruns.

The study was based on a questionnaire survey among professionals of the construction industry. The results, together with empirical data from ten completed projects have been presented. Five significant factors, that influence construction cost overruns, have been identified, and they include incomplete design at time of tender, technical omissions at design stage and contractual claims. These factors have further been classified under such categories as variations and contractual claims, according to the format of final account reports.

The paper recommends that there is need to identify significant factors that may influence construction cost overruns and deal with them from the inception of the project. This will result in significant decrease in the occurrence of cost overruns and improve cost performance of projects. Although the research concentrates on public projects in Botswana, the findings should be valuable to other developing countries.

Keywords: *Contract sum, Cost performance, cost overruns, client/customer satisfaction, factors.*

INTRODUCTION

One of the challenges facing the construction industry in developing countries is the chronic problem of construction cost overruns. Under normal circumstances it would be possible for a complete set of drawings and specifications to be made available to the Quantity Surveyor, who would prepare fully described and accurate bills of quantities for tendering purposes, The Aqua Group (1992). This would lessen changes during the construction stage, as the contractor would have all the necessary information on which to base the price. However, such a situation is not always the case, (Knowles, 1986; Fisk, 1988).

As a result the contract sum cannot always be regarded as a firm price. Even where the work is ordered on "Fixed price contract" basis, there will still be remeasurements of provisional works, adjustment of prime cost and provisional sums, and variation orders to contend with. The cost arising from these unforeseen circumstances is the sure cause for the adjustment of the contract sum, (Ashworth, 1988; Seeley, 1997; Kwakye, 1997)

It happens, therefore, that the initial tender price is not what is finally paid. This is because there are many factors that influence cost overruns. This, without saying, results in poor cost performance of construction projects, leaving many a customer unsatisfied.

It should be noted that a favourable cost performance of any given project depends on the effectiveness of the contract sum.

The word “effective” according to the Oxford Advanced Learner’s Dictionary, means having an effect or producing an intended result. It also means ‘actual’, like in actual cost of construction works.

In construction, however, it is difficult to talk about the actual construction cost, that is, the money the client pays the contractor for carrying out the work, Kwakye (1997), until the project has been completed and the final account agreed upon. For this reason, the anticipated final construction cost is always referred to as the projected or estimated final account.

Despite this state of uncertainty, the client will always want to know how much the project would cost, (Ashworth, 1988; The Aqua Group, 1992; Seeley, 1997). As Ashworth argues out, even where the project is to be carried out as a matter of urgency the cost may be of less importance but cannot be easily ignored, (ibid). It should be noted that construction cost, like the quality of work, is one of the Key Performance Indicators (KPIs), or performance measurement standards, (Kerzner, 1998; Martin, 1999). This poses a challenge to the professionals of the construction industry. A challenge to improve productivity and cost performance of projects to the satisfaction of the customer.

This is particularly becoming imperative, more so that cost and time overruns have given the construction industry a poor image, Radujkovic (1999). Radujkovic cites a recent study in which only 16% of the projects were considered successful, that is, completed on time, within budget, and to specification. He also cites another report that recorded substantial cost overruns in 63% of the construction projects that were studied.

Although local literature is hard to come by, experience has shown that the construction industry in Botswana, like in other developing countries, is not free from incidents of cost overruns. The question is what should be done so that cost performance of public projects can be improved and how?

Usually, cost overruns are loosely blamed on lack of cost control. However, this is said to stem from a poor definition of cost control that focuses on only monitoring of costs and recording of data. Whereas, an effective cost control system is dependent on the original plan of works against which performance will be measured, Kerzner (1998).

This paper seeks to evaluate the cost performance of public projects in Botswana and sets out to identify and rank the factors that influence cost overruns. Research findings are presented together with empirical data from completed public projects. In discussing cost overruns, this paper limits itself to the construction cost as represented by the tender amount, which once accepted becomes the contract sum. Previous research has attempted to discover the reasons for the disparity between the tender sum and the final account, although without much success, Ashworth (1988). This study is of great importance in that it raises the level of awareness and gives the design team a sense of preparedness from the inception of the project.

The paper has been organised as follows: first, there is a literature review on the problem of cost overruns, which will be followed by identification of the factors that influence cost overruns. Second, the objectives of the study, the method of data collection, and the structure of the questionnaire employed are described. This will be followed by presentation of the research findings together with empirical data from ten completed public projects in Botswana. Third, the results of the questionnaire survey together with the empirical data from completed projects will be examined and discussed. The factors that influence cost overruns will also be ranked in order of significance. The significant factors will then be classified in

categories according to the format of final account reports, and further ranked in order of importance. Finally, conclusions will be made together with recommendations.

THE PROBLEM OF COST OVERRUNS

There have been many research projects on cost and time overruns, (Kaming, *et al.*, 1997; Cox, *et al.*, 1999; Radujkovic, 1999).

These research findings have one thing in common. It was found that there were more cases of cost overruns than time overruns. This makes the problem of cost overruns to be of great significance.

Most of the previous studies had concentrated on a few factors that influence time and cost overruns, such as design changes which has been reported to account for 5 – 8% of the total project cost, Cox, *et al* (1999). This selective approach leaves out many factors that one encounters in the final account reports. The best approach should, probably, be to investigate most of them and rank them accordingly. Although some of the factors may seem to be insignificant on one project, they may prove to be significant on another project, as conditions are not always the same.

It would appear, there will always be need for debate and further research because of the chronic problem of construction cost overruns. As one arbitrator once observed, it is difficult to imagine a building contract, which proceeded to completion without delay or variation whatsoever, Knowles (1986). However, this does not mean that there are no building projects that have been completed within budget. The concern is that such ideal situations are rare, (*ibid.*; Fisk (1988). Research has found that there are more building projects that had cost overruns than those which were completed within budget, Radujkovic (1999). The scenario of cost overruns has been blamed on the many factors that influence construction cost overruns, Kaming, *et al* (1997).

IDENTIFYING FACTORS THAT INFLUENCE COST OVERRUNS

Previous research has attempted to discover reasons for the disparity between the tender sum and the final account, Ashworth (1988). This section identifies the factors that influence cost overruns. As has already been stated, this study considers cost overruns in relation to the tender amount, which once accepted becomes the contract sum. As such only factors that influence such cost overruns were identified.

Four factors were identified from the existing research findings, (Kaming, *et al.*, 1997), Cox, *et al.*, (1999), and Radujkovic, 1999). These are as follows:

1. Design changes;
2. Inadequate planning;
3. Unpredictable weather conditions; and
4. Fluctuations in the cost of building materials.

To broaden the investigation, it was decided to complement the above list of factors with other factors gleaned from the final account reports. These were compared with the factors from the existing research findings, and a final list of 18 factors was prepared. These were then divided into two groups of seven critical factors and nine other factors, which are usually ignored, but perceived to be of equal significance. The critical factors are the ones that were considered to be significant, and these incorporated the ones that were identified to be significant from the previous research findings. The said two lists of factors which were identified are as follows:

List of critical factors:

1. Incomplete design at the time of tender.

2. Additional work at client's request.
3. Changes in client's brief.
4. Lack of cost planning/monitoring during pre-and- post contract stages.
5. Site/poor soil conditions.
6. Adjustment of prime cost and provisional sums.
7. Remeasurement of provisional works.
8. Logistics due to site location.
9. Lack of cost reports during construction stage.

List of other factors, which are usually ignored:

1. Delays in issuing information to the contractor during construction stage.
2. Technical omissions at design stage.
3. Contractual claims, such as, extension of time with cost claims.
4. Improvements to standard drawings during construction stage.
5. Indecision by the supervising team in dealing with the contractor's queries resulting in delays.
6. Delays in costing variations and additional works.
7. Omissions and errors in the bills of quantities.
8. Ignoring items with abnormal rates during tender evaluation, especially items with provisional quantities.
9. Some tendering maneuvers by contractors, such as front-loading of rates.

The above factors were then used in the formulation of the questionnaire.

OBJECTIVES AND METHODOLOGY

The objective of the study was to identify the factors influencing cost overruns, rank them in order of significance to raise the level of awareness. The objective was to be achieved through a questionnaire survey and an evaluation of final account reports for ten completed public projects to provide empirical data.

From the existing research findings and final account reports, it was possible to identify the factors that influence cost overruns. These were organised into a questionnaire. The questionnaire was designed to enable respondents to add any other factor that they considered necessary for inclusion to the list of 18 factors. The questionnaire survey was supported by, informal interviews and discussions with some of the respondents.

DATA COLLECTION

Responses to a questionnaire were received from forty-six professionals of the construction industry, comprising architects, engineers, quantity surveyors, and project managers. The respondents comprised consultants in the private sector and the professionals in the public service with over five years' experience of the Botswana situation.

Fluctuations in the cost of labour and materials were not listed among the factors. It was, however, expected that respondents would bring it up, and this is reported under any other factors in table 1.

RESULTS, DATA PRESENTATION AND DISCUSSION

The first question was to establish whether construction cost overruns is a problem in Botswana. All respondents considered it a problem that needs to be addressed. However, they did not consider all the

above listed factors to be significant in as far as their experience is concerned. Also they did not consider tendering maneuvers by contractors, such as front-loading of rates to gain as much money as possible during the early stages of construction, to be a problem in Botswana. Nevertheless, all the factors that were listed were considered to be contributory factors that should not be ignored on any given project.

Four factors were considered to be critical (see table 1). These were the ones considered by at least 50% of the respondents.

Table 1. Critical factors

Factor	Respondents
Incomplete design at time of tender	78%
Additional work at client's request	57%
Changes in client's brief	52%
Lack of cost planing/monitoring	50%
Site/poor soil conditions	41%
Adjustment of p. c. and provisional quantities	26%
Re-measurement of provisional quantities	24%
Logistics due to site location	20%
Lack of cost reports	13%
Any other	2%

Three factors featured prominently in the list of other factors that are normally ignored. Again, these were the ones that were considered by at least 50% of the respondents.

Table 2. Other factors

Factor	Respondents
Delays in issuing information (Construction stage)	72%
Technical omissions at design stage	57%
Contractual claims (such as, extension of time)	50%
Improvements to standard drawings	46%
indecision by the supervising team	41%
Delays in costing variations	33%
Omissions & errors in bills of quantities	24%
Front-loading of rates	22%
Items with abnormal rates	20%

Table 1 and 2 above, shows in general terms the areas of concern. Respondents were then asked to state the increase in cost over and above the contract amount on most of their projects at the final account stage. This is recorded in table 3.

Table 3. Degree of cost overruns on most projects

Percentage increase	Respondents
Less than 5%	26%
5% to 15%	48%
16% to 30%	9%
31% to 45%	2%
46% to 60%	4%
61% to 75%	nil
76% to 100%	2%
over 100%	nil

The main causes for the above reported cost overruns were given as:

1. Incomplete design at time of tender.

2. Additional work at the client's request.
3. Technical omissions at design stage.
4. Adjustments of prime cost and provisional sums.
5. Contractual claim, that is, extension of time with cost claims.

It is clear from the above factors that the first three would fall under variations. This gives three prominent categories, in relation to the format of final account reports as outlined below. However, the list does not tie up with the one derived at after examining the empirical data which lists four categories, including remeasurement of provisional works and fluctuations in the cost of labour and materials as will be seen later.

1. Variations.
2. Adjustment of prime cost and provisional sums.
3. Contractual claims, that is, extension of time with cost claims.

Empirical data

Ten randomly selected projects were examined to validate the above research findings. The investigation involved examining the respective final accounts to assess the influences of the various factors on the contract sum. It is clear that the empirical data in table 4 below, compares well with the results of the questionnaire survey as recorded in table 3, regarding the degree of cost overruns on most projects. Cases of cost overruns applied on both small and large projects. As a result it could not be determined whether there was sufficient planning of design works for big projects as compared to the small ones.

Causes for the above stated cost overruns, over and above the contract sum, were remeasurement of provisional works (3.28%), variations (6.34%), fluctuations in the cost of labour and materials (3.34%), and contractual claims, that is, claims for extension of time with cost (2.70%). It is evident from the above categories that the list of cost overrun influences do not tie up with the one arrived at from the questionnaire. The differences could be due to various circumstances as will be explained later in the analysis of the above categories. However, judging from the empirical data, four categories do emerge, which excludes the adjustment of prime cost and provisional sums. These categories are as follows:

1. Variations.
2. Remeasurement of provisional works.
3. Fluctuations in the cost of labour and materials.
4. Contractual claims, that is, claims for extension of time with cost.

By classifying the various influencing factors under the above categories, narrows the problem and helps to deal with it effectively. It also helps to consider other factors under the respective categories before dismissing them as insignificant on any given project. It is not realistic however to believe that all the factors that influence cost overruns can be brought under control. Nevertheless, it would be sensible to identify them and try to reduce their influence, Al-Khalil and Al-Ghafly (1999). As Radujkovic (1999) points out, by identifying and analysing the factors that influence cost overruns, it will raise the quality level of preparation and project control, and this will result in significant decrease in the occurrence of cost overruns.

Table 4. Case study - sample projects

Project	Completion date	Cost overrun
Offices block, Kazungula	1989	7%
Office block, Maun	1990	10%
Office block, Makopong	1991	-13%
Offices block, Selebi-Phikwe	1991	21%
Office block, Goodhope	1994	-24%
Office block, Maun	1994	2%
Office block, Gaborone	1995	14%
Office block, Kasane	1996	15%
Offices block, Gaborone	1997	7%
Aircraft hanger, Gaborone	1998	-10%

The above table shows that seven out of ten projects had cost overruns. Although this may not be the most reliable conclusion, given the small sample, it however indicative of the problem of cost overruns on public projects in Botswana.

ANALYSIS

Variations

Variations are change orders. These design changes may be ordered at the client's request, or the architect or engineers decision to rectify any errors or omissions in the quality or volume of work shown on contract drawings, and as described or referred to in the bill of quantities, The Aqua Group (1986). Variations have a double effect. First, they may contribute to cost overruns and second, they may also affect the progress of the works, resulting in claims for extension of time with cost by the contractor concerned, in the case of increased scope of work.

From the questionnaire and empirical data analysis, variations could be ranked as having the most significant influence on cost overruns. However, it would be difficult to rank the remaining three influencing factors in order of significance as their influences are closely related. All the four factors should, however, be regarded as significant factors when considering the factors that may influence cost overruns on any given project. The significance of these factors is supported by findings of the previous research projects reported earlier in this paper, that is, design changes, fluctuations, and insufficient planning of design work.

As can be seen, both design changes and insufficient planning of design work can be classified under variations. There are many factors that can be classified under variations including additional at the client's request. This makes variations one of the most significant categories to be considered in the implementation of any project. How, if one may ask, can the change orders by the client be avoided? The answer is by understanding the client's requirements from the briefing stage and to come up with a concise brief. This was the feeling of most of the professionals who were interviewed.

From the sample of ten projects reported in this paper, it was difficult to identify any variations ordered at the client's request for most of them. However, there seem to be a change in the presentation of variation orders as one examines some of the latest final accounts. There is a clear distinction between instructions issued by the architect and any changes ordered at the client's request. This is because the client's professional advisors have, in recent years, been asked to justify why they had issued variation orders. This approach could improve cost performance of projects, as the professionals concerned will be more careful during the design stage.

REMEASUREMENT OF PROVISIONAL WORKS

The substructure, plumbing, and external works are usually measured as provisional in the bill of quantities, subject to remeasurement at a later stage during the construction of the works. Remeasurement becomes necessary due to, but not limited to, the following reasons.

1. Unforeseen circumstances such as poor soil conditions which may necessitate re-designing of the foundations. For example, there has been a case in Botswana where contractors were asked to dig up pits of up to one meter deep and fill them up with imported material before constructing the foundations.
2. Lack of details at tender documentation stage.
3. Where the foundations and roadwork have not been designed in accordance with the soil investigation report, or where such a report had given misleading information or lack of it.
4. Substantial rock in foundations than envisaged which may require expensive blasting methods.

Remeasurements are inevitable on any project. However, if a project is well planned and detailed, chances are, there will be fewer items to be remeasured. From the empirical data analysis of the projects examined, remeasurements contributed an average cost overruns of about 3% of the contract sum. Considering individual projects, it can be reported that some of them recorded cost overruns of up to 6% of the contract sum as a result of remeasurements, while others recorded savings. This shows that it is possible to have savings if the design is well developed and detailed, [Fisk (1988), The Aqua Group (1992)].

ADJUSTMENT OF PRIME COST AND PROVISIONAL SUMS

In Botswana, especially with public works, estimated values of prime cost sums are included in the bill of quantities to cover electrical and mechanical installations by nominated sub-contractors. The work is then tendered for separately, at a later stage. From the empirical data analysis one could see cases of either underestimating or overestimating. Both practices are not good and are misleading. Provisional sums may equally present problems. Provisional sums are included in the bills of quantities to cover work to be executed by statutory authorities such as power and water connections. Provisional sums are also included for work of which the full extent cannot be determined at the time of preparing the bills of quantities, Seeley (1997).

From the empirical data analysis, it was noted that some of the projects that reflected savings had a lot of provisional sums, which were later omitted from the contract. It was also evident that there were increases in the value of measured works despite the savings arising from the provisional sums. This shows that there could be possibilities of cost overruns even where savings are reported. A carefully planned project should have less provisional sums.

FLUCTUATIONS IN THE COST OF LABOUR AND MATERIALS

Where a fluctuation clause is inserted in the contract documents, it allows the contractor to claim for the net increase in the cost of labour and materials after the date of tender. Most respondents did not consider this to be of great concern, although it has been found to be a significant factor after evaluating the sample of projects. This is probably because of the practice of ordering projects on "Fixed price contract" basis in Botswana.

This practice shifts the responsibility to the contractor who should diligently allow in his tender the cost for fluctuations in labour and materials. How effective this is could be a subject for another research.

Contractual claims

These arise from loss and expense claims, and legal costs due to contractual disputes, Kwakye (1997). Non of the ten projects examined were taken to arbitration. Most of the claims for the projects studied, were for loss and expense claim relating to extension of time with cost.

From the questionnaire survey and the public projects evaluated, contractual cost overruns resulting from claims of extension of time with cost, can be attributed to variations that result in increased scope of works.

General comments

It can be seen that most of the above factors, chiefly, emanate from actions and omissions of both the client and his professional advisors. In this regard one could argue that the first step towards minimising cost overruns is to deal with the human factor, Radujkovic (1999). Cost overruns of 5 – 15% as presented in table 4 above are considered to be substantial and can offset the client's overall budget. As has already been stated, there are many factors that influence cost overruns. This makes it difficult to control cost overruns during the construction stage alone. Instead, there should be sufficient planning of the project at the inception stage. Drawings and other tender documents should be well detailed before going out to tender.

The construction industry is said to be essential to any country's economic development, Construction Review (2000). And governments are increasingly talking about sustainable economic activities. Consequently, the construction industry, as an economic activity, needs to be sustainable. However, to ensure a sustainable construction industry, there is need to harness all the resources, that is, financial, material, and human resources. The approach should aim at safeguarding the client in terms of value for money, resulting from good cost performance of projects. Medley (1996) specifies three stages of cost management. This is during the design stage, the tender stage (by getting the best price), and during the construction stage. This is necessary because cost overrun can occur at any stage of the construction process, Kerzner (1998). This implies good cost management from inception to completion. This being the case all the members of the design team must be involved from the inception stage, Ashworth (1988).

It is true that the efficient system of cost control in the construction industry is the responsibility of the quantity surveyor, Ashworth [(1988), Seeley 1997)]. However, the alleviation of the problem of project cost overruns should be regarded as a matter of teamwork. This is because the actions and omissions of all the members of the design team are likely to affect the construction cost of the project, Ashworth (1983). We learn from literature that there is growing pressure to improve performance of the construction industry even in developed countries, Martin (1999). To this effect, seven key performance indicators (KPIs) have been developed in the UK and are becoming the standard benchmarking measurements. The key performance indicators include the construction cost. This confirms the importance of the construction cost as an integral part of any project specification

CONCLUSION

An evaluation of ten public projects was carried out to assess their cost performance. The results have shown that seven out of ten projects had reported cost overruns. The factors that influence cost overruns have been identified and ranked in order of significance. These factors have further been classified under categories according to the format of final account reports. By classifying them into categories, helps to deal with them effectively. The four categories arrived at are: variations, remeasurement of provisional works, contractual claims and fluctuations in the cost of labour and materials, with variations being the most significant.

From the results of the questionnaire survey and the empirical data from the sample of ten projects, it can be concluded that public projects in Botswana, like in other developing countries, are not free from cases of

cost overruns. This poses a challenge to the professionals of the construction industry. A challenge to improve cost performance of projects to the satisfaction of the customer.

RECOMMENDATION

From the above findings one can make the following recommendations:

1. There is need to identify the factors that may influence cost overruns and deal with them from the inception of each project. This will decrease the occurrence of cost overruns, Radujkovic (1999).
2. Insufficient planning of design works has been alluded to in this paper. Since design changes are a result of insufficient planning, a careful study should be carried out to determine the appropriate time scale in which to produce designs and other tender documents. This will help improve the quality of tender documents and lessen changes during the construction stage.

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