

# **AN ANALYSIS OF COST MANAGEMENT STRATEGIES EMPLOYED BY BUILDING CONTRACTORS ON PROJECTS IN ZIMBABWE**

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## **Abstract**

The construction industry is a major consumer of capital resources by virtue of the magnitude, complexity and nature of the works it executes. Yet improving cost performance still remains a chronic challenge facing the construction industry worldwide. Apart from advances made by contractors to devise mechanisms to manage project cost, studies across the world reveal that construction projects are hardly completed within budget. The Zimbabwean construction industry has not been spared either. However, this background is considered unhealthy for an industry whose capital consumption is heavy and concomitant cost overruns spell disastrous financial consequences on the investor. This study explored cost management strategies employed by contractors on building projects and also investigated the challenges that contractors encounter in managing project cost. Exploratory research design was employed making use of both questionnaires and interviews to collect data from selected contractors registered under category A, B and C of the Construction Industry Federation of Zimbabwe (CIFOZ). The study observed that in the majority of cases, contractors' efforts to manage projects costs are centred on management of project resources. Additionally, monthly cost reports, variance management, project budgets and cash flow forecasting are among the other strategies. However, in spite of the growing trend to automate cost control systems, there is evidence to suggest that the traditional paper based systems of storing and managing information is widely used in the industry. Contrary to having cost management systems in place, contractors admit experiencing cost overruns on their projects. These cost overruns are attributable to organizational related challenges, shortage of skilled personnel, and unavailability of some building materials on the local market, variations and deficiency in cost control systems.

**Keywords:** *Construction, Cost management strategy, Cost overrun, Zimbabwe*

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## **1.0 Introduction**

The construction industry is a key industry to economic growth of any nation providing shelter for economic and social activities including on-site and off-site infrastructure to facilitate the smooth functioning of these activities. The industry does not only touch on the lives of virtually everyone on a daily basis; it occupies a fundamental national position in many national economies - the bellwether of economic growth [1] As a result of the sizeable nature of projects executed; the industry requires substantive injection of capital and any loss through failure or abandonment has a crippling effect on the capabilities of the investors and financiers [2]. Notwithstanding the complex nature of the work undertaken by the construction industry, cost and time need to be effectively monitored and controlled if the anticipated profit margin will be realized for the contractor and for the project to be completed within the budget cost of the client [3]. To this end, financiers and executors (contractors) of construction works are bound to be cost conscious if their business objectives are to be realized from the project. In Zimbabwe, despite containment of inflation (from around 231 million percent in December 2008 to less than 3% by

the first quarter of 2013), the prevailing liquidity crunch has the potential to influence the stance taken by both clients and contractors in respect of management of project cost. According to [4] contractors who do not stay current on costs may suffer 'disastrous' consequences on their already slender profit margin. To safeguard their primary objectives (of survival, growth and profitability), contracting organisations should put in place an effective cost management system within the structure of their organisations [5]

Irrespective of the economics generated through effective cost management, most projects are delivered over-budget. Nine out of ten projects faced cost overrun in the range of 50 to 100% [6]. The problems of project cost overrun are considered to be more severe in developing countries where the overrun sometimes exceed 100% of the anticipated cost of project [7]. In a previous study based on selected building projects conducted in Zimbabwe after the introduction of multi-currency regime, it was noted these projects (at various stages of construction) had overspend their budgets by an average overrun of 34% [8]. Prior to this period, Joina centre, a commercial building in the heart of Harare, had its budget revised several times. In Nigeria, the rate at which construction projects fail or are abandoned is retrogressive [2] and the minimum average percentage escalation cost of projects was 14% [9]. Such margins on cost overrun are huge when compared against arguments presented by [10] where cost overruns of between 10-15% are considered substantial and has potential to offset the client's overall budget. However, the problem of cost overrun is not peculiar to developing countries. In Norway, the challenge of project overruns is so prevalent that [11] summed that public building projects will always overrun their estimated costs; it's just a question of by how much. And yet a project cost which is out of control affect viability of a construction project and often adds to investment pressure, increases construction cost, reduces investment profit, affects investment decision-making and, above all, it causes disputes that turn down the overall project progress [12, 13]. With such a background, the need for effective cost management systems in contracting organisations cannot be overemphasized. In fact, cost control should be seen as an important management tool that is crucial for the survival of a construction company [14]. It is an essential objective of any firm and as such a cost control system is considered the nerve centre of a well-run contracting organization [15, 16]. However, apart from the importance of cost management to the construction industry, it has not received the attention that it has in other industries, for example, production engineering [3].

This research, which is part of a broader study on cost management in the Zimbabwean construction industry, sought to investigate the cost management strategies employed by contractors on building projects in Zimbabwe and examine the factors that militate against contractors' cost management efforts. Despite the contractors' ability to pass on project costs to clients, they remain the immediate victims of the consequences of poor cost management. And for that reason, the study focussed on contractor's cost management. Although a number of manuscripts are available worldwide discussing construction cost management, there is notably lack of such literature in Zimbabwe. This research will, among other things, contribute to the development of this body of knowledge on construction cost management in Zimbabwe. In addition, the research findings will provide a platform upon which remedies may be instituted for the betterment of the industry.

## **2.0 Review of Related Work**

Cost management is an approach used to realize decisions made for planning, controlling and developing competitive strategies, and it is noteworthy to say that making a balance between this factor and other dimensions of competition such as quality and time is required [17]. It is the control of costs through the formal process of budget development, monitoring, and adjustment to achieve the maximum amount of work at a specified level of quality where unknowns and uncertainty may cause costs to increase beyond acceptable levels [18]. The Project Management Institute [19] considers cost management as primarily concerned with the cost of resources needed to complete project activities and would be achieved through a process involving estimating,

budgeting, and cost control. However, cost management is much more than simply maintaining records of expenditure and issuing cost reports - it means understanding how and why costs occur and promptly taking the necessary response in light of all the relevant information [4]. Thus the key question to stay competitive in construction enterprise is cost management and control [4]. In a study in Thailand, [20] concluded that contractors perceive cost control as a prerequisite for profit maximization. However, to deliver a project within budget requires careful planning and taking appropriate action especially during project execution. Thus during project execution, procedures for project control and record keeping become indispensable tools to managers and other participants in the construction process [21]. Two ready-made types of contractor cost management systems: the big picture monthly review of the project and a more detailed analysis of the sections within the project in order to identify those sections of works that are underperforming [4].

Over the years, contractors developed several cost management strategies to assist them to record all financial transactions that occur as well as giving managers an indication of the progress and problems associated with a project [21]. Some of the strategies, tools and techniques used by contractors to manage cost, include but not limited to: cost-value reconciliation, earned value analysis, variance analysis [4, 19, 22], cash flow forecasting [15, 4, 19], the plan and schedule, combination estimate and schedule [19], project status report, profit and loss at valuation dates or overall [22] and monthly cost reports [21]. These tools may be used singularly or in combination. However, apart from earned value, the other cost control techniques suffer from lack of real time reporting. Earned value management has gained more acceptance and use in developed countries. For example, in the USA, it is a requirement that contractors and sub-contractors working on defence projects employ earned value analysis [23]. On the other hand, traditional cost control processes, common with most developing countries, are criticized because they simply identify variances by monitoring actual performance against cost estimates. For example, cost projection is not usually taken into consideration [24]. In addition to the above stated strategies, cost control software such as Microsoft Project [19, 22] and Asta Power Project, Project Costing System (PCS), Construction Industry Software (COINS), WinQS, Microsoft Excel, and other bespoke systems [25] are used for cost control. Whilst there is no doubt that effective formal control systems are necessary for effective project control, every day on-going control is even more important, and informal activities are a vital part of this part [26]. The choice of the system depends on, among other factors, economic considerations. In that regard, for a cost control system to be cost effective, cost of control should never exceed the value of control, must operate in a timely manner and should be as simple as is possible to operate [27].

However, apart from the proven importance that cost carries with regards to project performance and the advances that have been made by the construction industry to manage cost, most projects are delivered above agreed budgets. A cost overrun is measured as actual out-turn costs minus estimated as a percentage of estimated costs [28]. Lower than expected productivity, higher than expected wage costs, higher than expected material costs, among other factors, cause cost overrun on projects [21]. With these factors in mind, [29] suggest that cost control will be achieved by selecting the right man for the right job, the right equipment for the right job and the right quality of materials, in the right quantity from the right source, at the right price and delivered at the right time. A critical requirement of cost management procedure is timely availability of cost information with very little delay between fieldwork and management review of performance [1]. This would give the project manager enough space to take corrective action while opportunity exists for that. However, the existing cost control systems suffer from lack of real time reporting [21]. The cost of this approach is a cost management crisis where contractors are made aware that a project has over-spent when it is too late to take corrective action. Apart from providing reasonable ground upon which an informed decision can be made, a cost management system offers no panacea to cost management challenges. In fact what is needed is the managerial decision that something should be done differently and effecting such decision [28].

### **3.0 Methodology**

The research methodology is discussed under research design and data collection methods.

#### **3.1 Research Design**

The research was largely qualitative, employing exploratory design. Exploratory design is particularly suitable in areas where there is little experience to serve as a guide [30]. It is an initial research which analyses the data and explores the possibility of obtaining as many relationships as possible between different variables [31]. This methodology was found befitting for this research due to unavailability of published literature on this subject in Zimbabwe. The methodology, therefore, provided a conduit for diagnosing the situation, discovery of ideas and insights.

Although the study is meant to reflect on the whole country, however, due to the dominance of Harare and Bulawayo, the majority of the targeted companies were taken out of these two cities. Harare is the capital city of Zimbabwe while Bulawayo is the second largest city. Based on 2013 statistics of construction companies registered with the Construction Industry Federation of Zimbabwe (CIFOZ), 80.64% of contractors in Category A, B and C are in Harare, while 7.5% are from Bulawayo. Category A contractors enjoy unrestricted caps on tendered jobs, whilst category B and C contractors are registered for work of a maximum value of US\$ 6,000,000 and US\$ 3,000,000 respectively. Collectively, Harare and Bulawayo account for 88% of CIFOZ registered contractors in these categories. Contractors that participated in the study were first stratified into three selected categories and convenience sampling was then used to select individual companies in each category. The research had a target of 30 contractors (representing 32.25% of the population). A sample size of 30 has been corroborated by [32, 33] and Griffin and Hauser cited by [34]. The Economist [32] advice of a sample size of a minimum of 30 for statistical analysis and that this provides a useful rule of thumb. The magnitude of projects undertaken by contractors in category A to C is usually medium-to-large and such ventures involve substantial capital injection hence the interest to manage costs on such projects is great. A cost overrun on such projects implies serious financial consequences on both the contractor and the client.

#### **3.2 Data Collection Methods**

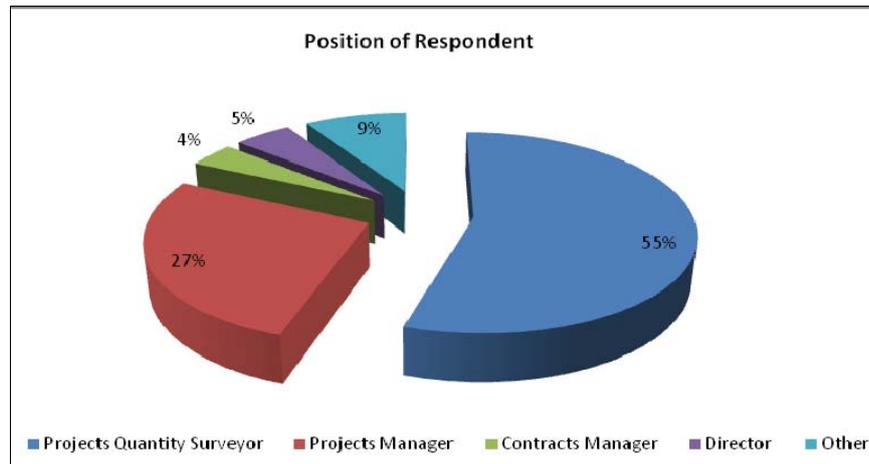
The study used semi-structured questionnaires and interviews to solicit information from construction industry practitioners within the construction firms, who included among others: project quantity surveyors, project managers, contracts managers and directors. The questionnaire had both closed-ended questions and open ended questions. Questions relating to strategies employed by contractors to manage costs and challenges encountered were left open-ended. The basis for this approach was two-fold: to check contractors' understanding of cost control and to allow them to brain storm and reflect on the strategies they use on a day to day basis. In addition to questionnaires, follow-up interviews were also conducted with selected five experienced respondents to further triangulate data obtained from the questionnaire survey and to explore the experiences of the respondents in relation to the strategies employed, their effectiveness and constraints encountered to achieve cost efficiency. Data gathered was analysed using Statistical Package for Social Scientists (SPSS version 16). Data from open ended questions was pre-coded before entry into SPSS. The study relied on literature for pre-analysis coding of responses from questionnaires. In addition to primary data, the study also reviewed literature from textbooks, journals, conference presentations and selected websites on cost management.

## 4.1 Results and Discussions

This section presents results, analysis and inferences drawn from the study. These will be discussed under the following headings.

### 4.1 Demographics of Respondents

Figure 1 below shows the distribution of respondents.



**Figure 1:** Position of Respondent in a Contracting Company

Out of the targeted 30 contractors, 22 responded giving a response rate of 73%, that is, 23.65% of the population. The respondents, who had a cumulative construction industry work experience of 166 years (average of 7.22 years), were distributed in the following order: project quantity surveyors (55%), project managers (27%), contracts managers, directors and others (14% collectively). The study drew 72.4%, 18.2% and 9.1% of its respondents from category A, B and C contractors respectively. Despite loss of experienced personnel in 2008 following the macro-economic meltdown in the country, the demographics of the respondents who participated in the study shows that they had relevant technical experience to provide valid responses to questions included in the questionnaire and interviews.

### 4.2 Strategies for cost management

The strategies employed by contractors to manage cost are summarized in Figure 2 as follows: cost reports (31.8%); cost estimating and budgeting (36.4%), variance analysis (54.5%); resources management (59.1%), cost value reconciliation (CVR) (31.8%) and cash flow analysis and work programmes (18.2%), and other factors, for example, project meetings (13.6%). Cost estimating and budgeting, variance analysis and cost value reconciliation are mostly used by contractors in category A and B, while resources management and variance analysis are used by contractors in all the three categories. However, contractors in category C did not show much use of cost reports, cost estimates and budgets, and cost value reconciliation. Although there is a growing trend to automate cost control systems (as shown by an increase in use of such software as Microsoft Project, Microsoft Excel and other in-house systems), however, overreliance on the mechanistic Microsoft Excel and paper-based systems pose challenges especially where there is need for real-time reporting. These findings are not unique to Zimbabwe. Research in Uganda indicates that work programmes, reports, project budget and inspection of works, among others, are the techniques used to manage project cost [35]. In Nigeria, [5] noted that project budget was the most frequently used tool followed by monitoring of labour and material cost respectively. However, what differs between these countries is the weighting attached for each strategy. For

instance, in Uganda work programmes are weighted high, while this same factor has a very low frequency in Zimbabwe. Figure 2 below summarises contractor cost management strategies. The identified strategies are discussed in the subsequent sections.



**Figure 2:** Cost Management Strategies on Building Projects

#### 4.2.1 Resources management related strategy

Cognisant of the impact of resource utilisation on project cost, 59.1% of contractors employ a resource-centric strategy to cost management. This resources management strategy is divided into materials management (including but not limited to: bulk-buying of materials, secured storage of materials, monitoring site materials movements, material reconciliation); labour management (labour engagement strategy, supervision of site labour, monitoring labour outputs, performance based labour rewarding, employment of site security personnel); and plant and equipment management (utilisation schedules, timing of plant availability). Most contractors buy key materials like bricks, cement, just to mention some, directly from manufacturers where they also receive trade discounts. On site, material registers, plant registers and labour time cards are used to manage movement of resources and minimize idleness and misuse of resources. In addition, the project manager through the site foremen oversees site resource utilisation and/or loss through theft, vandalism and wastage. These efforts are meant to control variances in resource utilisation (quantity and efficiency) which may impact negatively on project cost. Earlier studies by [21, 19, 8] reveal some close relationship between resources consumption and project cost. Project cost is identified as a result of resource consumption and therefore the success of a project depends upon performance management of resources when controlling costs. These results are also confirmed by [5] in Nigeria and [35] in Uganda although at varied ratings. According to [36] the need to control costs is important in order to eliminate the unnecessary wastage of resources.

#### 4.2.2 Variance Management (variance analysis and cost value reconciliation)

Under this strategy contractors employ collectively or independently variance analysis and cost value reconciliation. Variance analysis and cost value reconciliation (CVR) are employed by 54.5% and 31.8% of the contractors respectively. Whilst variance analysis is used by all the three categories of contractors, CVR is more prevalent with category A and B contractors. Variance analysis compares budgeted against actual spending on a project. On the other hand CVR is not limited to comparison of planned against actual expenditure but also focus on value generation. CVR helps contractors to assess the magnitude by which their profit is changing as a project progresses. Variance analysis forms an essential part of CVR reporting procedure. However, it does not portray the true cost of performance of a project. It is because of these limitations that

contractors are migrating to CVR especially when projects get bigger and more complex. CVR allows forecasts to be made of the project's cost and profitability to completion, at any given date of reconciliation. Collectively variance management allows the contractor to note the existence of a variance in project costs (labour, material or overhead costs) and thus offering an opportunity for the contractor to assess the possible drivers of cost variance(s) so as to institute appropriate remedial action. Irrespective of the arguments on the importance attached to timeliness and accuracy of variance reporting and its interpretation in cost management [37], this study noted that such assessments are done on a monthly basis – thus corresponding to the 'big picture monthly review' [4]. Although the use of such tools as S-curves was noted, however, the extent of use remains limited.

#### *4.2.3 Cost estimating and budgeting*

Cost estimates and budgets are also used by 36.4% of contractors. Contractors prepare cost estimates and produce budgets based on appropriate contract documents which include but not limited to prepared bills of quantities (BoQs) and drawings. Such budgets become the benchmark upon which project cost performance will be monitored and controlled. The use of cost estimates and budgets concur with findings by such researchers like [1, 19, 38, 21, and 40] whose presentations suggest that for one to successfully control project costs one would need to know what goes into making up the total project budget. Thus the estimate and budget form the entry point to cost management. In Thailand, a study by [20] indicated that from a contractors' perspective an accurate estimate is not only vital for winning a contract with the chance of winning profit but also serving as an effective plan for cost control.

#### *4.2.4 Cost Reports*

Cost reports provide progress information that is used to assess project performance against set targets. These are used by 31.8% of the contractors. The study observed that 59.1% of the contractors produce cost reports on a monthly basis, while 18.2% report weekly, 4.5% daily and 18.1% any other times. Whilst there is no rule cast-in-stone on reporting intervals, what is clear is that the reports should be prepared often enough so that excessive project cost can be detected while there is enough time to take corrective action [1]. The research noted an inherent relationship between project cost reports and cost value reconciliations. This relationship is evidenced by the two being used by an equal number of contractors under study and at similar period(s), that is, monthly. This consequently suggests that the two strategies have been jointly used and are therefore complimentary to each other.

#### *4.2.5 Cash-flow analysis and work programmes*

Cash flow forecasting and work programmes are used by 9.1% of the contractors respectively. Cash flow forecasting involves breaking of the project budget against the construction programme of works to produce a project cash flow. Though not equivalent to earned value analysis, cash flow forecasting tries to relate the project's cash flow against the time as reflected in the schedule of activities. In that regard, contractors use programmes concurrently with project cash flow to manage and control project costs. This approach allows the contractor to relate project cost performance against project programme or schedule. The frequency for cash flow analysis obtaining in Zimbabwe is at variance with arguments put forward by Hwee as cited by [5]. The later argue that that cash flow forecasting is the most important factor that can affect project profitability once the construction project is in progress. Apart from arguments presented in earlier studies that project cost is a function of project schedule [Carr, 1993 in [39], this study observed very low frequency for work programmes.

#### 4.2.6 Other factors

In addition to the above identified factors, project meetings are also used by 13.6% of the contractors to manage project cost. Project meetings provide a platform to discuss project progress and cost performance and also provide an opportunity to identify areas that are not performing well and proffer alternative solutions.

### 4.3 Statistical Inference of Cost Management Strategies

A chi-square test was performed to analyze the significance of the above strategies. Table 1 below shows the outcome of the test.

**Table 1: Chi-square Test on Cost Management Strategies**

Test Statistics								
	Cost Reports	Cost Estimating & Budgeting	Variance Analysis	Resources Management	Work Programmes	Cost Value Reconciliation	Cashflow Forecasting	Others (meetings)
Chi-Square	2.909 <sup>a</sup>	1.636 <sup>a</sup>	.182 <sup>a</sup>	.727 <sup>a</sup>	14.727 <sup>a</sup>	2.909 <sup>a</sup>	14.727 <sup>a</sup>	11.636 <sup>a</sup>
df	1	1	1	1	1	1	1	1
Asymp. Sig.	.088	.201	.670	.394	.000	.088	.000	.001

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 11.0.

Thus Chi-Square 95% at 1 degree of freedom (df) as shown in Table 1 is 3.841 and this eliminates all the strategies with test statistic greater than 3.841 which are work programmes and cash flow forecasting and others such as meetings. The outcome of this statistical inference shows that cost reports, cost estimating and budgeting, variance analysis and resources management are the significant strategies in this study. These results, to some extent, correlate well with findings in a study on cost control practice in Nigeria where establishment of working budget, monitoring labour cost, monitoring material cost were found to be highly significant methods of managing cost. However, these findings contrast with observations by Hwee in [5] and Carr in [39] with respect to work programmes and cash flow forecasting in cost control.

### 4.4 Problems Encountered by Contractors in Managing Project Cost

The factors that affect contractor's efforts to manage costs are categorised as: labour related challenges (64%); organisational problems (50%); material related challenges (36%); variations (23%); cost control systems related challenges (18%); plant related challenges (14%); funding challenges (14%); inaccurate estimate (9%) and others (5%). These factors are illustrated in Figure 3.

The challenges to cost management presented in Figure 3 above can be grouped into: exogenous and endogenous factors. Exogenous factors include: resources related challenges (labour, materials and plant), funding challenges, and variations; while endogenous factors include: organisational, deficient cost control systems and incorrect estimates.



**Figure 3:** Challenges to Cost Management

#### 4.4.1 Exogenous factors (Externally Induced)

Lack of experienced staff, material price fluctuations, unavailability of certain materials on the local market and inefficient or obsolete plant were identified as the resources management related challenges that impact on contractors' cost management efforts. However, labour-related challenges had the highest frequency. Lack of experienced personnel reflects on the period of mass exodus of skilled labour from Zimbabwe to other countries from the year 2000 to 2008. Most skilled and experienced artisans and professionals left the country for greener pastures in neighbouring countries like South Africa, Botswana and Namibia, and other distant countries like United Kingdom, United Arab Emirates, and New Zealand. A majority of them are still 'locked' up in these countries. Brain drain of such magnitude adversely affected construction output and performance. The spill over effects of inexperienced cost personnel and shortage of skilled labour manifest in deficient cost control systems, inefficient cost control procedures and poor workmanship. Another labour related challenge related to reduced labour productivity. The impact of labour related challenges on cost management practice was also noted in Nigeria, where engagement of inexperienced staff had a high rating factor [41].

On the other hand, unavailability of certain materials on the local market and fluctuations in material prices also presented challenges to cost management. Apart from the gains made through the introduction of multi-currency regime in the country, the key materials manufacturing industries, for example, cement and steel manufacturing just to mention some are yet to be fully capacitated to meet demand for these materials. In 2012 the President of CIFOZ indicated that challenges related to critical shortage of such inputs as cement and bricks, together with under-capitalisation of major construction companies and liquidity constraints all served to limit the sector's capacity to emerge as one of the top contributors of the country's Gross Domestic Product (GDP) [42]. Under such circumstances contractors are held in some waiting period for the supply of certain materials or alternatively resort to importation of some materials with concomitant disadvantages of delaying the project and pushing up project cost through payment of idle labour and increased price of materials. This challenge has not been limited to Zimbabwe. In Uganda, [35] suggest that lack of materials and equipment, among other factors, presented difficulties to contractors' efforts to control project costs. In the Indian construction sector is besieged with project procurement and execution problems ranging from non-availability of materials and equipment as per schedule, delay in payments of the completed work due to paucity of funds [36]. In Nigeria, price fluctuations, inaccurate estimates, design changes and shortage of materials impacts are attributed to project cost overrun [5]. In addition to resources related challenges, variations also affect contractor's efforts to manage project cost. Variations disturb flow of the programme and impact on cost through time. Whilst the 'lower' quartile rating

accorded to variations in this study confirms similar findings in Nigeria by [9], however, these findings are at variance with studies in Botswana where variations are considered a strong factor in influencing cost overrun on public sector projects [7]. On the other hand, late honouring of claims by clients, though not a significant factor as shown by a chi-square test in Table 2 is another cost management challenge identified by contractors. In South Africa delayed interim payments and settlement of final accounts is also reported as a common problem [36].

#### 4.4.2 Endogenous factors (internally induced)

Within contracting organisations, organisational deficiencies (poor methods of communication, poor planning, contract administration and site organisation), level of development of cost control systems, inaccurate cost estimates and policies on procurement of resources impact on cost management efforts. For example, inefficient communications systems, management interference in technical aspects of the project, failure to recruit personnel and plant of right ‘calibre’ negatively affects efforts directed towards cost management. Yet against this background scholarly writings indicate that contractor’s management capability has significant impact on cost and time performance of building projects. On the other hand, inaccurate estimates of project cost also pose a challenge to cost management. Due to inexperience and other related factors, contractors sometimes under-price tenders thereby increasing their chances of winning tenders or inexperienced estimators inaccurately-estimate the value of works to be executed. However, inaccurate estimates disrupt construction and budget programmes. A study by [28] observed that cost estimates are often inaccurate. Similar findings were also noted in South Africa where the Construction Industry Development board (cidb) suggest that undue focus on lowest price to the detriment of best value impacts on the performance of contractors who invest their innovation in the winning of the contract, fully prepared for the claims that will be necessary to remain afloat [36]. The study shows that 59% of the contractors produce cost reports on a monthly basis – a time period that is considered ‘standard’ in the Zimbabwean construction industry – however, such time period may be considered long enough to advise the contractor that the project underperformed a month ago.

#### 4.5 Significance Test of the Challenges to Cost Management

A Chi-square test was performed to show the significance of the challenges identified for cost management. This is shown in Table 2 below.

**Table 2: Chi-square Test of the Challenges to Cost Management**

Test Statistics									
	Labour related challenges	Organisational problems	Materials related challenges	Project funding challenges	Variations	Deficient cost control systems	Incorrect cost estimates	Contractor Incompetence	Other
Chi-Square	.727 <sup>a</sup>	.182 <sup>a</sup>	1.636 <sup>a</sup>	11.636 <sup>a</sup>	6.545 <sup>a</sup>	4.545 <sup>a</sup>	11.636 <sup>a</sup>	12.250	4.000
df	1	1	1	1	1	1	1	1	1
Asymp. Sig.	.394	.670	.201	.001	.011	.033	.001	.000	.046

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 11.0.

Thus Chi-Square 95% at 1 degree of freedom is (df) 3.841 and this eliminates the problems with a chi-square greater than 3.841. Therefore, labour related challenges, organizational challenges and material related challenges are the significant factors affecting contractor’s efforts to manage project cost. The other factors, which include: project funding challenges, variations, incorrect cost estimates and contractor incompetence, were found not significant.

## **5.0 Conclusions and Recommendations**

The study observed that in the majority of cases, contractors' efforts to manage projects costs are centred on management of project resources. This resource-centric strategy premised on materials, plant and labour resources management is founded on the principle that resources consumption stimulates building project costs. Statistical analysis performed through chi-square test at 95% shows that: cost reports, cost estimating and budgeting, variance analysis, cost value reconciliation and resources management are the significant factors employed by contractors to manage costs on building projects in Zimbabwe. However, despite the existence of these strategies, most contractors admit that their projects would, in most cases, end with a cost overrun. This may be inferentially explained by a host of challenges affecting cost management practice. Whereas several challenges were observed with respect to cost management, it is labour related challenges, materials related challenges and organisational problems that impact significantly on cost management practice. The study also observed that the cost management process in Zimbabwe, like in other developing countries in Africa and elsewhere is still dominated by the traditional paper based system or 'prematurely' developed automated systems of managing project cost information. In a nutshell, the problem in Zimbabwe is not about having the strategies to manage costs but relates to 'flawed' implementation. The findings of this research suggest that the strategies instituted to manage project cost and, the challenges to such practice are not significantly different from the ones in other developing countries including but not limited South Africa, Botswana, Nigeria and Uganda. To improve on the effectiveness of contractors' cost management strategies in Zimbabwe, the research recommends that contractors pay particular attention to problem areas that significantly affect cost management (labour, material and organisational related challenges), engagement of experienced cost management personnel or upgrading of staff's professional ingenuity through conventional training, refresher courses or participation in seminars; and regular review of cost management systems and strategies. The industry can also take advantage of advancement in ICTS to automate their cost information management systems. This study has provided baseline information on the strategies used to manage project cost and related challenges; however, further research is needed to assess the effectiveness of these strategies to manage project cost.

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