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## **COST OVERRUN FACTORS IN CONSTRUCTION INDUSTRY: A CASE OF ZIMBABWE**

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### ***ABSTRACT***

Cost overruns (the amount of money by which actual costs exceed the initially approved costs) continue to characterize a plethora of construction projects, especially large projects. This is the reason why the hot debate in the construction industry on how to minimize cost overruns has been on for some time, especially among construction economists and engineers and yet the inability to complete construction projects within the budget remains a chronic problem worldwide. In Zimbabwe, it is now almost obvious that once a construction project has commenced; it will not be completed within the initial project budget. This study seeks to empirically determine cost overrun factors in the construction industry in Zimbabwe. From the analysis of the questionnaire, cost overrun factors were ranked using the Relative Importance Index (RII) technique. The overall results analysis indicate that poor estimation of original cost, lack of timeous reports during construction stage, corruption, construction productivity and contractual claims are amongst the top ten most important factors causing construction cost escalation. The study managed to come up with recommendations which are 7 – fold and are envisaged to help construction economists, managers and policy makers in initiating positive changes in the construction industry in Zimbabwe.

**Key Words:** Construction cost, Construction industry, Relative Importance Index (RII), Zimbabwe.

**JEL Codes:** L74

### **INTRODUCTION**

Infrastructure is the backbone of economic development for any country (Prasad *et al*, 2019). Many governments have invested huge amounts of capital in infrastructure projects and programs in order to contribute to socio-economic development of their country (Andric *et al*, 2019). In fact, the construction sector plays a central in the economy of any country, providing essential structures such as private and public infrastructure and housing (Kirchberger, 2018). The construction industry plays a strategic role in developing countries like Zimbabwe (Nyoni & Bonga, 2016) and in Zimbabwe, several researchers e.g Chigara & Moyo (2014) as well as Nyoni & Bonga (2016 & 2017a) have recognized the importance of the construction industry. It is quite imperative to note that the general goal in any industry is to achieve the completion of a project within time and stipulated budget. The construction industry of Zimbabwe, just like in any other countries; is always facing serious problems that usually lead to cost overruns. An out of control construction cost, as noted by Ali & Kamaruzzaman (2010); adds to investment pressure, increases construction

cost, affects investment decision – making and wastes the national finance. Realistic estimation of cost is quite important, especially for both successful planning and completion of every construction project.

Cost is undoubtedly the most important concern in any business endeavor, not at least in the construction industry (Bari *et al*, 2012). The demand for more construction of all types, coupled with a tight monetary supply has provided the construction industry with a big challenge to cut costs (Ikechukwu & Akiohnbare, 2017), hence the need for well – informed cost estimation. Estimating, as noted by Tyler (2004); is an art, not science because there is no estimate that fits all work. In fact, many past researchers perceived that qualitative factors including project complexity, project team requirement, contract requirements and market requirement (Elinwa & Buba, 1993; Akintoye, 2000; Chan & Park, 2005) have a higher impact on the total project compared to quantitative factors such as gross external floor area, median floor height and construction duration (Stoy & Schalcher, 2007; Stoy *et al*, 2008). Poor cost performance has become a major concern for both contractors and clients (Xiao & Proverbs, 2002; Memon *et al*, 2010). Realizing and understanding cost – determinants will enrich the cost estimator’s competence, hence, adequately delivering a more sustainable and reliable cost modeling and estimating technique (Elhag *et al*, 2005).

Based on the fact that construction cost estimation<sup>1</sup> is subjective in nature (Toh *et al*, 2012); it is quite essential to investigate the factors influencing costs in the construction industry in Zimbabwe. This study seeks to identify and rank the relative importance of factors affecting cost of construction as perceived by consultants, contractors, owners and industry experts. Understanding the factors affecting cost of construction, amongst other things; assists policy makers in developing reliable cost forecasting models and building more successful construction projects.

### **Objectives**

- i. To identify cost overrun factors in the construction industry in Zimbabwe.
- ii. To determine the relative rank in terms of importance of each cost overrun factor identified in i. above.
- iii. To analyze the effects of cost overrun in construction projects.

## **LITERATURE REVIEW**

### **Related Studies**

Olawale & Sun (2010) investigated the cost and time control of construction projects and found out that design changes, risks/uncertainties, inaccurate evaluation of project time/duration, complexities and non – performance of subcontractors are the main causes of cost and time overrun. Toh *et al* (2012) conducted a survey on the critical cost factors of building construction projects in Malaysia and found out that only 35 cost factors were regarded by the respondents working for the small, medium and large construction

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<sup>1</sup> *Construction cost estimate is the amount envisaged to finish a construction work. It is the probable amount that is computed to complete a construction work (Oyedele, 2015).*

companies in the Klang Valley, Malaysia as highly relevant for building construction projects. Bari *et al* (2012) investigated factors influencing the construction cost of Industrialized Building System (IBS) projects and found out that project characteristics, contractor attributes and external market conditions are the most important factor affecting construction cost. Memon *et al* (2014) analyzed factors affecting construction cost performance in MARA large projects and found out that fluctuation in price of material, cash flow and financial difficulties faced by contractors, shortage of site workers, lack of communication between parties, incorrect planning and scheduling by contractors are most severe factors while frequent design changes and owner interference are least affecting factors on construction cost performance in MARA large projects. Subramani *et al* (2014) studied the causes of cost overrun in construction in India and found out that slow decision making, poor schedule management, increase in material/machine prices, poor contract management, poor design/delay in providing design, rework due to wrong work, problems in land acquisition, wrong estimation/estimation method, and long period between design and time of bidding/tendering are the major causes of cost overrun.

Durdyev *et al* (2017) examined cost overrun factors in Cambodia and found out that project and cost management, project finance as well as project risk factors were the main determinants of cost overrun. Johnson & Babu (2018) looked at cost overruns in UAE construction industry and noted that the main cost overrun factors were design variation, poor cost estimation, delays in client's decision making process, financial constraints of clients and inappropriate procurement method. Franca & Haddad (2018) analyzed the causes of construction projects cost overrun in Brazil and found out that the change of scope, lack of design detail during budgeting and high indirect cost in a period of low productivity were the main cost overrun factors. Seddeeq *et al* (2019) investigated time and cost overrun in the Saudi Arabian oil and gas construction industry and concluded that changing of design and scope by client during construction, poor planning and scheduling of project, design errors, inadequate comprehension of scope of work at the bidding stage and underestimating of cost and schedules/ overestimating benefits were the main drivers of cost overrun. Prasad *et al* (2019) analyzed cost overrun factors in India and concluded that delay in payment for extra work, delay in settlement claims by owner, contractor's financial difficulties and late payment from contractors to subcontractors were the main cost overrun factors.

## **MATERIALS & METHODS**

The methodology of this research is basically comprised of three phrases, i.e. literature review, interviews and questionnaire survey. Seventeen (17), factors affecting cost of construction were identified based on both literature review and interviews. The sampling technique used in this study is the heterogeneous sampling technique. The questionnaire employed in this research was a closed ended questionnaire, whose response rate is shown in the table below:

Percentage (%)
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Returned	127	87
Returned but not properly filled	13	8.9
Not Returned	6	4.1
Total Distributed	146	100

A total of 146 questionnaires were distributed to industry experts, consultants, contractors and owners. Only 127 questionnaires were completed and analyzed, giving a response rate of approximately 87%. In line with Tavakol & Dennik (2011) and Creswell (2014), reliability and validity were carefully checked through analyzing the questionnaires for both preciseness and appropriateness.

#### Data Analysis Technique

Data analysis technique employed in this study is the Relative Importance Index (RII) a formula that was adopted from previous studies by Nyoni & Bonga (2016 & 2017a) and Nyoni (2018d):

$$RII (\%) = \left[ \frac{(5n_5 + 4n_4 + 3n_3 + 2n_2 + n_1)}{5(n_5 + n_4 + n_3 + n_2 + n_1)} \right] \times 100\% \quad \text{----- [i]}$$

Where  $n_1$ ..... $n_5$  are the number of respondents who selected: [1] very weak, [2] weak, [3] fair, [4] strong and [5] very strong.

## RESULTS & DISCUSSION

### Factors Affecting Cost of Construction in Zimbabwe

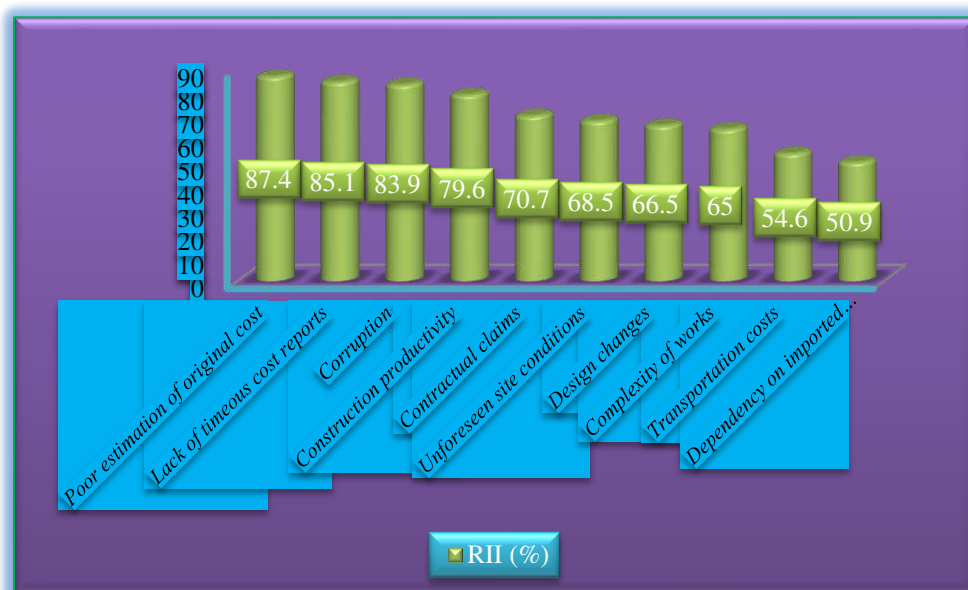
**Table 1.** Factors Affecting Cost of Construction in Zimbabwe

Factor	RII Index	Overall Rank
Poor estimation of original cost	87.4	1
Lack of timeous cost reports during construction stage	85.1	2
Corruption	83.9	3
Construction productivity (labor shortage, unskilled labor etc.)	79.6	4
Contractual claims (extension of time with costs)	70.7	5
Unforeseen site conditions	68.5	6
Design changes	66.5	7
Complexity of works	65.0	8
Transportation costs	54.6	9
Dependency on imported materials	50.9	10
Obsolete construction equipments	49.3	11

Unpredictable weather conditions	45.8	12
Ignoring items with abnormal rates (tender evaluation)	43.1	13
Additional work at owner's request	40.9	14
Fluctuation in the cost of materials	36.7	15
Unstable interest rates	31.8	16
Changes in construction methods	30.2	17

### Top Ten Cost Overrun Factors

Figure 1. Top ten cost overrun factors



#### ***Poor estimation of original cost***

This cost overrun factor ranked 1<sup>st</sup> with an RII index of approximately 87.4%. Our findings are similar to those of Peeters & Madauss (2008) and Johnson & Babu (2018) who basically argued that the biggest factor that contributes to overruns of budget is inaccurate estimation of original or initial cost of a project; a phenomenon that can be attributed to lack of adequate project information especially in the early stages of the project.

#### ***Lack of timeous reports***

This factor ranked 2<sup>nd</sup>, with an RII index of nearly 85.1%. Timeous reports facilitate proper cost control, therefore; reports should be written and submitted in time.

#### ***Corruption***

The existence of corruption in Zimbabwe has been recognized by many researchers e.g Nyoni (2017), Bonga *et al* (2015), Sithole (2013) as well as Makumbe (1994, 2009 & 2011) amongst others. Corruption ranked 3<sup>rd</sup>, with an RII index of approximately 83.9%. There is need to deal with corruption in the construction sector in Zimbabwe, especially bribery.

### ***Construction productivity***

Construction labour productivity is an important factor in construction projects management and Nyoni & Bonga (2016) and Chigara & Moyo (2014) have already highlighted this fact in the case of Zimbabwe. This factor ranked 4<sup>th</sup>, with an RII index of approximately 79.6%. Improved productivity plays a pivotal role in saving both time and resources.

### ***Contractual claims***

This factor ranked 5<sup>th</sup>, with an RII index of about 70.7%. While contractual claims are usually associated with delays, they also result in cost escalation. Therefore, there is need to internalize contractual claims.

### ***Unforeseen site conditions***

In the construction industry, actual site conditions may not be determined probably until excavation is finished. This is normal and common; unfortunately, it increases costs. In this study, unforeseen site conditions ranked 6<sup>th</sup> with an RII index of approximately 68.5%. These results confirm previous studies such as Nega (2008), who argued that sometime possible site conditions are overlooked by the initial review or conditions have changed because of weather conditions or sub – soil conditions.

### ***Design changes***

Issues to do with design in the construction industry have been discussed by Nyoni & Bonga (2017a) and it has been shown that these factors are usually associated with both delays and cost escalation. Design changes ranked 7<sup>th</sup>, with an RII index of around 66.5%. These results are in line with Johnson & Babu (2018) and Seddeeq *et al* (2019).

### ***Complexity of works***

This factor ranked 8<sup>th</sup>, with an RII index of approximately 65%. Normally, in large construction projects, such as the construction of a bridge; cost escalation is nearly inevitable due to the nature of project complexity.

### ***Transportation Costs***

Transport is an important service in the construction industry in Zimbabwe. However, just like elsewhere, it is affected by price of fuel in the sense that as the price of fuel goes up, transportation companies are likely to raise the cost of their services in an effort to cover up for fuel costs. Transportation costs ranked number 9, with an RII index of approximately 54.6%. The results of this study confirm the findings by Ikechukwu & Akiobnare (2017).

### ***Dependency on imported materials***

The construction industry in Zimbabwe frequently runs out of materials and resort to importing even basic materials such as cement. This is very true because cement production in Zimbabwe is still very low and Zimbabwe continues to spend lots of money in importing cement and other materials. This factor ranked 10<sup>th</sup>, with an RII index of approximately 50.9%.

## **Least Important Factors Affecting Cost Overrun in Construction Industry in Zimbabwe**

**Figure 2.** Least important factors affecting cost overrun in construction industry in Zimbabwe



#### ***Obsolete construction equipment***

This cost overrun factor ranked 11<sup>th</sup> with an RII index of approximately 49.3%. Our results confirm previous studies such as Long *et al* (2008) and Nyoni & Bonga (2016; 2017a). Obsolete construction equipments are a burden to the construction project since they result in poor productivity and subsequently influence an escalation in costs through frequent repair and maintenance.

#### ***Unpredictable weather conditions***

As a matter of fact, weather affects the productivity of workers and according to Frimpong *et al* (2003); if the temperature and humidity are high, workers feel lethargic and lose physical coordination. Indeed, weather conditions may be completely unpredictable; however, construction managers should keep abreast with weather forecast from the meteorological department. This factor ranked 12<sup>th</sup>, with an RII index of approximately 45.8%.

#### ***Ignoring items with abnormal rates (tender evaluation)***

This factor ranked 13<sup>th</sup>, with an RII index of approximately 43.1%. This clearly indicates the importance of proper tender evaluation in the quest to control cost escalation in construction projects.

#### ***Additional work at owner's request***

This factor ranked 14<sup>th</sup>, with an RII index of almost 40.9%. Owners need to correctly specify what they need on the ground; otherwise additional work itself is a cost factor. However, the RII index of less than 50% indicates that this factor is relatively less important.

#### ***Fluctuation in the cost of materials***



This factor ranked 15<sup>th</sup>, with an RII index of nearly 36.7%. Our results confirm previous studies such as Omoregie & Radfort (2012) and Memon *et al* (2014). Fluctuation in the cost of materials in the construction industry in Zimbabwe could be attributed to the current economic instability fueled by liquidity crisis.

#### ***Unstable interest rates***

In deciding whether to invest or not in a certain project, a firm must compare the rate of return with the interest rate. Therefore, the net investment apparently depends on the total volume of investment projects where the expected rate of return exceeds the interest rate (Nyoni & Bonga, 2017f). Over the past three decades, interest rates have been very high and unstable; thus negatively affecting the construction industry. This factor ranked 16<sup>th</sup>, with an RII index of approximately 31.8%. While stability of interest rates may be an important factor in other countries, in Zimbabwe; the study shows that this factor is less critical in light of construction cost management.

#### ***Changes in construction methods***

This is the least important factor as shown by an RII index of nearly 30.2%. This could be attributed to the fact that construction methods do not change frequently. When a certain method is adopted, it is consistently used until project completion unless there are vivid reasons for seeking to change the construction method.

#### **Methods of Minimizing Construction Cost in Construction Industry in Zimbabwe**

- i. Employ highly qualified workforce in order to improve productivity.
- ii. Carry out adequate cost – studies in order to pave way for realistic cost estimates.
- iii. Proper analysis of client needs, clearly distinguishing between real and stated needs.
- iv. Proper communication amongst all stakeholders involved in the construction project.
- v. Proper project costing and financing.
- vi. Risk management during project execution.

#### **RECOMMENDATIONS**

- i. Construction companies in Zimbabwe should do away with their old construction equipment and acquire new technologically advanced construction equipment. This will go a long way in saving both time and money in construction.
- ii. To avoid sub – standard estimations, construction economists should rely more on extensive data rather than mere cost estimations from *nowhere*.
- iii. Construction reports should *always* be prepared and disseminated timeously.
- iv. The government of Zimbabwe should always intervene to control fuel prices. This is quite important because as the price of fuel increases, transportation companies also raise the cost of their services to cover up for the fuel increase and that definitely translates to an increase in transportation cost.
- v. The government of Zimbabwe should create opportunities for local consultants and contractors to mix and mingle with international consultants and contractors in order to share experiences and consequently adopt new technologies.

- vi. Corruption is very harmful and unacceptable (Nyoni, 2017) and therefore all stakeholders in the construction sector should not engage in corrupt practices for any reason. It is quite interesting and encouraging to note that the new political dispensation in Zimbabwe does not entertain corruption at all levels.
- vii. To improve labour productivity in Zimbabwe, construction economists and project managers ought to take note of the thirteen most important factors affecting construction labour productivity as identified by Nyoni & Bonga (2016). Productive workers go a long way in reducing cost overruns.

### CONCLUSION

Cost overruns are very common in the construction industry (Subramani *et al*, 2014) and are one of the main problems. Cost overrun is a worldwide phenomenon and its effects are normally a source of friction between owners, project managers and contractors (Creedy *et al*, 2010). The trend is more severe in developing countries (Azhar *et al*, 2008) such as Zimbabwe. Hardly few projects get completed within original costs (Subramani *et al*, 2014). The key factor in a project's success is the accurate cost estimation at its early stage (Shabniya, 2017). It requires careful attention to address this matter. Keeping construction projects within estimated costs and schedules requires sound strategies, good practices and careful judgement (Enshassi *et al*, 2009). While all the factors identified in this study ought to be addressed, greater effort must be directed towards the top ten cost overrun factors.

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