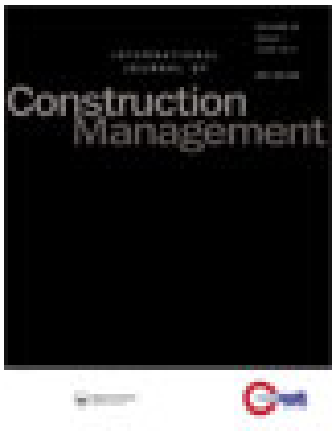

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Cost Escalation, Schedule Overruns and Quality Shortfalls on Construction Projects: The Case of Zambia

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COST ESCALATION, SCHEDULE OVERRUNS AND QUALITY SHORTFALLS ON CONSTRUCTION PROJECTS: THE CASE OF ZAMBIA

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Abstract
The construction industry plays a central role in the creation of any nation's wealth. For developing economies, it forms the backbone of most industries. However, cost escalation, schedule overruns and quality shortfalls on construction projects often offset the intended contribution of the industry to the economy. The aim of the study reported in this paper was to highlight major causes of cost escalation, schedule overruns and quality shortfalls in the context of the Zambian construction industry. Using a questionnaire survey, the results of the study confirmed the prevalence of cost escalation, schedule delays and quality shortfalls on construction projects in Zambia. Clients, consultants, contractors and financiers identified 'insufficient initial analysis of costs' and 'change orders' as the most frequent and severe factors that caused cost escalation. 'Change order changes' and 'financial difficulties on the part of the contractors' were ranked as the most frequent and severe causes of schedule overruns. On the other hand, 'poor financial management' was established to be the most common and severe factor that caused quality shortfalls on construction projects. Appropriate project management practices and training have been recommended for construction projects to be executed successfully, especially in developing economies like Zambia.

Keywords
Construction projects, cost escalation, schedule overruns, quality shortfalls, Zambia.

INTRODUCTION

The construction industry is a conglomeration of diverse fields and participants that are loosely lumped together as a sector of the economy (Hendrickson and Au, 2003). The industry plays a central role in national development. The importance of the industry lies in the function of its products that provide the foundation for industrial production. As such, the construction industry's impact on national economies need not be measured by the value of its output or the number of persons employed in its activities alone (Ibid). Effective and efficient management of the industry is, therefore, important.

It is axiomatic of construction management that a project may be regarded as successful if it is completed on time, within budget, and is of the desired quality (Falqi, 2004). However, cost escalation, schedule overruns and quality shortfalls can occur due to a wide range of causes. If project costs or schedules exceed their planned targets, client satisfaction could be compromised. If project quality does not meet design standards, the client's satisfaction would also be compromised. The resulting effects could be detrimental to the national economy, especially in developing countries, where the measure of wealth is mainly dependant on the construction industry's performance in the provision of required infrastructure.

Many, if not most, construction projects in Zambia have experienced cost escalation, time overruns as well as quality shortfalls (Kaliba et al., 2009). The public and many other stakeholders have expressed dissatisfaction with the delayed handover of, and prevalent quality shortfalls on many construction projects. Most of the time, contractors have been blamed for the poor performance of the industry (The Post, 10/01/2008).

THE ZAMBIAN CONSTRUCTION INDUSTRY

Zambia is a landlocked country in Sub-Saharan Africa. It has a population of 13.5 million and a Gross Domestic Product (GDP) of US$19.2 billion. The construction industry in Zambia experienced a fast growth rate ranging between 9.9 and 20.5 percent over the past decade. It has been one of the primary contributors to economic growth of the country (Bank of Zambia, 2011).

The Zambian construction industry can be sub-divided into two main sectors: consultancy; and contracting. The contracting sector can further be sub-divided into 4 sub-categories: building; civil engineering; materials manufacturers; and materials suppliers. Within the industry, 21 consulting firms were registered with the Association of Consulting Engineers of Zambia (ACEZ, 2012) and 1,946 contractors with the National Council for Construction (NCC, 2012) in the year 2012. Out of the 1,946 registered contractors, only 93 firms were allowed to tender for works whose value was US$ 5 million and above. Less than 20 percent of these were locally owned companies (NCC, 2012).

Traditionally, projects are procured using the design-tender-construction method. Under the traditional system, the design is initially developed. Then an engineer's estimate based on the design is used as the basis on which costs, time and quality could be controlled. From 2008 onwards, it was observed that bid prices for projects were more often much higher than engineers' estimates. In subsequent years, as a consequence, there was a shift towards the turnkey method of procurement. This approach eliminated the use of engineers' estimates. The basis for cost, schedule and quality control aspects would be based on the accepted offer by the bidder.

LITERATURE REVIEW

Cost escalation has been described to be a ubiquitous problem especially in government funded projects in developing economies (Datta, 2002). Mansfield et al.

(1994) and Schexnayder et al. (2003) among others investigated causes of cost escalation on construction projects. Literature suggests that causes of cost escalation are numerous, with varying levels of significance in different countries. Merewitz (1973) identified: the size of the project; project scope enlargement; inflation; length of time to complete the project; incompleteness of engineering designs and quantity estimates; engineering uncertainties; exogenous delays; complexities of administrative structures; and inexperience of administrative personnel as probable causes of cost overruns. Mansfield et al. (1994) showed that the major factors that caused cost escalation were: poor contract management; improper planning; inaccurate estimating; and price fluctuations. Factors such as project location, site conditions, environmental mitigation costs, suspension of works, strikes, poor coordination on site, expiry of bid validity, local government pressure, political discontinuity and transportation problems were also identified to be potential causes of cost escalation (Schexnayder et al., 2003 and NAP, 2003). Kasimu (2012) conducted a similar study in Nigeria and concluded that market conditions; personnel experience in contract works; insufficient time for project execution; availability of materials and political situations were significant factors that cause cost overruns in building construction projects. Most of the reviewed literature, however, was either limited to a particular section of the industry or other countries. No similar study had been conducted in Zambia.

With regard to schedule overruns, a considerable number of studies have been undertaken worldwide, most of which aimed to establish causes of prolongation. Ahmed et al. (2002), Al-Moumani (2000), Chan and Kumaraswami (1997) and Assaf et al. (1995), among others, appear to have agreed on most causes of schedule overruns in the construction industry. The major causes of identified schedule overruns included: delayed approval of working drawings; delays in payments to contractors and the resulting cash-flow problems during construction; design changes; conflicts in work schedules of subcontractors; slow decision making and bureaucracy in client organizations; design errors; labour shortage; and inadequate labour skills. Mansfield et al. (1994) showed that the major factors affecting construction schedules were: poor financing and payment for completed works; poor contract management; changes in site conditions; shortages of construction materials; and improper planning. In a study of construction projects in Nigeria, Dlakwa and Culpin (1990) found that the major reasons for schedule overruns in public sector construction projects included: lack of prompt payment by agencies to contractors; fluctuations in material and labour availability; and plant costs. Inappropriate modes of financing and payment for completed works; improper planning; underestimation of duration of projects; frequent changes in designs and materials and materials specifications; and non compliance with contract conditions among other factors were found to be top ranked factors that affected project execution in Nigeria (Elinwa & Joshua, 2001). Frimpong et al. (2003) concluded that: poor contractor management; monthly payment difficulties from agencies; poor material procurement and technical performance; rising prices of materials; inclement weather; and unexpected natural events were possible causes of schedule overruns. Most of the reviewed studies on schedule overruns were, like those on cost escalation, skewed to particular sections of the construction industry.

A review of construction management literature suggests that there has been little focus on causes of quality shortfalls on construction projects. However, a study conducted by the National Council for Construction (NCC, 2006) suggested that: time lapse between assessment, procurement and implementation of a project; inadequate and inconsistent release of project funds by clients; poor financial management by contractors; inadequate supervision by contractors; corruption and demand for kickbacks by consultants prior to certification of works; incompetence of consultants, especially with regard to initial project assessment; incompetence and lack of capacity by contractors to execute works; and departure from core competences by government ministries to venture into construction were some of the reasons attributed to quality shortfalls on construction projects.

Most studies have attempted to deal with cost escalation, schedule overruns or quality shortfalls in isolation. It is note-worthy, however, that the occurrence of one of the three is likely to bring about adverse changes in the other two. This paper presents results of a study that took a holistic viewpoint with respect to cost escalation, schedule overruns and quality shortfalls on construction projects. In contrast, most studies reported in literature have tended to concentrate on specific areas of the industry such as: roads and highways; buildings; and water supply projects. While studies focussed on particular aspects of industry are important, it is also essential to identify drivers of cost escalation, schedule overruns and quality shortfalls in the industry in general.

RESEARCH METHODOLOGY

The methods used in the study reported in this paper included literature review, structured interviews and a questionnaire survey. Interviews sought to establish factors, from those identified from literature, which local industry participants could attribute to cost escalation, schedule overruns and quality shortfalls. While the results from the structured interviews are not reported in this paper, together with factors identified during the literature review, they were used in the construction of the questionnaire, the results of which are reported in this paper. The questionnaire method offers advantages in that a large coverage of the population being studied can be realized within limited costs and time period (Nkhata 1997). And because of the large sample size that can be covered, the results can be generalized and interpreted to be representative of the sample population. The letter that accompanied the questionnaire assured respondents their anonymity in order to obtain honest answers.

The questionnaire survey was carried out over a period of three months between November 2010 and January 2011. The questionnaires were sent to financiers of construction projects, clients, consultants and contractors working in the construction industry in Zambia. Respondents were identified via stratified random sampling. The questionnaire sought to rank other factors identified from literature and interviews in terms of their significance. The questionnaire elicited information from respondents based on their experience from the projects they had handled. The questionnaire required respondents to rate the factors identified from literature and interviews in terms of frequency of occurrence and severity of impacts on project delivery. A copy of the questionnaire used during the survey is attached as Appendix I. A total of 53

completed questionnaires were received out of 70 that were distributed, giving a response rate of 76 percent as shown in Table 1.

Table 1: Distributed and Received Questionnaires

	No. of questionnaires distributed	No. Completed & returned	Response rate %
Financiers	5	2	40
Clients	10	6	60
Consultants	15	8	53
Contractors	40	37	93
Total	70	53	76

During data analysis, responses from each group of respondents in Table 1 were stratified using correction factors presented in Table 2. The correction factors were obtained using the formula:

$$CF = \frac{G_{anr} \times T_r}{N_g}$$

Where:
CF is the correction factor;
G_{anr} is the actual number of respondents in a given group;
T_r is the total number of respondents; and
N_g is the number of groups.

Correction was undertaken to remove any bias that would arise from any group of disparate respondents, thus enabling the generalisation of the frequency of responses. For example, in order to compare responses of financiers to thoes of contractors, aggregated responses of financiers were multiplied by 6.625 while those of contractors by 0.358.

Table 2: Correction Factors for Each Group of Respondents

	Actual No. of respondents	Correction Factor	Equivalent No. of respondents
Financiers	2	6.625	13.25
Clients	6	2.208	13.25
Consultants	8	1.656	13.25
Contractors	37	0.358	13.25

QUESTIONNAIRE SURVEY RESULTS

Profile of Respondents

Respondents were from client, consultant and contractor organizations, as well as financiers of construction projects in either the public or private sectors of the industry. The data obtained indicated that 11 percent of the respondents worked for client organizations, 15% for consulting firms, 70% for contractors and 4 percent for financiers. The respondents' years of experience in construction ranged between 5 and

15 with over 65 percent having had more than 15 years in the industry. Fifty eight percent of the respondents had handled construction projects worth over US$10 million, while 14 percent had worked on those that cost less than US$5 million. The remainder worked on projects of values between US$5 million and US$10 million. The levels of experience of respondents suggested a fairly high degree of reliability of the study findings.

Delivery Performance of Projects

Respondents were asked to give their opinion on the performance of projects they had had handled with regards to cost escalation, schedule overruns and quality shortfalls. It was established that cost escalation, schedule overruns and quality shortfalls were prevalent in the Zambian construction industry. Eighty-five per cent of the responses suggested that one in every four projects executed had experienced cost escalation and schedule overruns. Cost escalation ranged between 0 and 30 per cent while schedule overruns fell between 10 and 50 per cent. On the other hand, 66 per cent of respondents indicated that less than 25 per cent of projects they had handled experienced quality shortfalls.

Data Analysis by Ranking of Factors

The use of weighted averages was adopted for developing factor ranking indices (Kaliba et al., 2009; Falqi, 2004). Factors attributed to cost escalation, schedule overruns and quality shortfall in construction projects were investigated for their frequency as well as their severity on project delivery. The calculation of the indices was based on weighted averages using the formulae (Falqi, 2004):

$$FI = \frac{\sum_{h=1}^{4} F_h P_h}{4\sum_{h=1}^{4} P_h} \quad (1)$$

Where: **FI** is the frequency index
$\mathbf{F}_h$ is a constant expressing the weight given to option h
$\mathbf{P}_h$ is the number of participants who responded to option h
And

$$SI = \frac{\sum_{k=1}^{4} S_k P_k}{4\sum_{k=1}^{4} P_k} \quad (2)$$

Where: **SI** is the severity index
$\mathbf{S}_k$ is a constant expressing the weight given to option k
$\mathbf{P}_k$ is the number of participants who responded to option k
Frequency and severity indices alone were not sufficient to determine the relative importance of any given factor. The factors that contribute to cost escalation, schedule

overruns and quality shortfalls on construction projects could be frequent but not severe and vice versa. The frequency and severity indices were combined to come up with Factor Importance Indices (FIIs).

Factor Importance Indices were generated in a two-step operation. The first step was the generation of a matrix for frequency and severity as shown in Table 2. The matrix indicates that out of the 16 possible combinations for integrating frequency and severity, there were only 9 possible scores that could be derived from this operation because the arrangement is symmetrical. For example, $F_1 \otimes S_2$ is equivalent to $F_2 \otimes S_1$; $F_2 \otimes S_3$ is equivalent to $F_3 \otimes S_2$, and so on. It is also noteworthy that since both frequency and severity had a scale of 1 to 4, $F_2 \otimes S_2$ could only be equivalent to $F_4 \otimes S_1$ and $F_1 \otimes S_4$. A scale of 1 to 9 was adopted with the lowest possible score given the weight of 1, while the highest possible was given the weight of 9.

Table 3: Weighted Frequency-Severity Matrix

⊗		Frequency			
		1	2	3	4
Severity	1	1	2	3	4
	2	2	4	5	6
	3	3	5	7	8
	4	4	6	8	9

FII was calculated using the formula (Falqi, 2004):

$$FII = \frac{\sum_{i=1}^{9} (F \otimes S)_i \, P_i}{9 \sum_{i=1}^{9} P_i} \quad (3)$$

Where: $(\mathbf{F} \otimes \mathbf{S})_i$ was the weight (1, 2… or 9) of the frequency-severity conjugation in Table 2 assigned to option i
$\mathbf{P}_i$ was the number of participants who responded to option i

In order to avoid bias from any group of respondents, i.e. financiers, clients, consultants or contractors, responses for each group were computed separately. Based on the computed FIIs, each factor was assigned a rank. The degree of correlation in ranking between any two groups of respondents was determined using the spearman formula below for rho (ρ) (Elinwa & Joshua 2001):

$$\rho = 1 - \frac{\sum d^2}{n(n^2 - 1)} \quad (4)$$

Where **d** was the difference in ranking between any two groups of respondents; and **n** was the number of factors.

When the computed value of ρ was greater than the critical value for any given set of data, this was evidence that there was correlation between rankings of the two respondent groups. The critical value was obtained from statistics tables. Based on the 'n' value and the adopted significance level, a corresponding critical value was selected for each case.

The overall ranking of each factor, taking into consideration those of each group of respondents, was determined by means of the Rank Agreement Factor (RAF) and the Percentage Rank Agreement Factor (PRAF) using the formulae (Elinwa and Buba, 1993; Elinwa and Joshua, 2001):

$$RAF = \frac{\sum(FinClieConsCont)}{N} \quad (5)$$

$$PRAF = \frac{RAF_{\max} - RAF_i}{RAF_{\max}} \times 100\% \quad (6)$$

Where: $\sum$ **(FinClieConsCont)** is the summation of the ranking order by financiers, clients, consultants and contractors;

N is the number of variable factors ranked; and
RAF_{max} is the maximum RAF
The closer RAF was to zero, the greater the level of agreement between the two groups of respondents was. RAF equal to zero meant perfect agreement (Elinwa and Joshua, 2001).

Cost Escalation

The 31 factors that were attributed to cost escalation from literature and interviews were rated and ranked according to the responses of each group of respondents. FII and corresponding rankings by each group of respondents is presented in Appendices II.

The spearman rank correlation, ρ, for cost escalation factors was computed. A 99 per cent confidence interval for the non directional test was adopted for this study. The results show that there was sufficient evidence to infer positive correlation between the rankings of all the groups of respondents with ρ being higher than the critical value of 0.459 by more than 0.2 in all cases. Summaries of the spearman rank coefficients are provided in Appendix II.

In order to come up with an overall rank for each factor, PRAF was calculated. The results are presented in Table 4. From the results, the top five factors attributed to cost escalation were: insufficient initial analysis of costs; change orders; inflation; schedule overruns; and delayed or non-settlement of Interim Payment Certificates (IPCs).

Table 4: Overall Ranking of Factors Attributed to Cause Cost Escalation

S/N	Cause	Financier ranking	Client ranking	Consultant ranking	Contractor ranking	Sum of ranking	RAF	PRAF	Ranking order
1	Insufficient initial analysis of costs	2	3	1	1	7	0.226	94%	1
2	Change orders/Scope changes	3	2	3	2	10	0.323	91%	2
3	Inflation	5	1	5	4	15	0.484	87%	3
4	Schedule delay/overrun	5	5	2	3	15	0.484	87%	3
5	Delayed or non payment of Interim Payment Certificates	10	5	4	6	25	0.806	78%	5
6	Inexperienced administrative personnel	9	10	6	5	30	0.968	74%	6
7	Corruption	1	9	9	13	32	1.032	72%	7
8	Bad weather (Heavy rains and floods)	7	8	8	10	33	1.065	71%	8
9	Disruption of management continuity	3	7	17	7	34	1.097	70%	9
10	Lack of organisational capacity/capabilities	10	13	7	8	38	1.226	67%	10
11	Local government pressures	7	13	10	11	41	1.323	64%	11
12	Unforeseen engineering complexities	10	10	12	18	50	1.613	57%	12
13	Project location	10	13	13	16	52	1.677	55%	13
14	Lack of coordination on site	10	23	11	9	53	1.710	54%	14
15	Poor contract management	16	13	14	12	55	1.774	52%	15
16	Poor technical performance	10	13	18	15	56	1.806	51%	16
17	Technical challenges	16	13	14	17	60	1.935	48%	17
18	Project conditions	16	13	14	19	62	2.000	46%	18
19	New technology requirements	23	3	27	21	74	2.387	36%	19
20	Transformation of community expectation	16	23	19	22	80	2.581	30%	20
21	Disruption of political continuity	20	29	20	14	83	2.677	28%	21
22	Unforeseen constructability issues	24	13	23	24	84	2.710	27%	22
23	Acquiring land	21	23	21	20	85	2.742	26%	23
24	Suspension of works	24	13	24	26	87	2.806	24%	24
25	Environmental protection & mitigation costs	24	13	24	30	91	2.935	21%	25

Schedule Overruns

The 40 factors that were attributed to schedule overruns in Zambia by interviewees were rated and ranked by questionnaire respondents. The FII and corresponding ranking by each group of respondents is presented in Appendix II. The non directional spearman rank correlation for schedule overrun factors was computed. A 99 percent confidence interval was adopted in the study as such the critical value obtained from statistical tables was 0.405. The results show that there was sufficient evidence suggesting correlation between the rankings of all the groups of respondents. Summaries of the spearman rank coefficients are provided in Appendix II.

The PRAFs were calculated and are presented in Table 5. The top five causal factors for schedule overruns were found to be: change orders; financial difficulties on the part of contractors; changes in drawings and specifications; delayed or non-payment of IPCs; and lack of qualified human resources.

Quality Shortfalls

As was the case with cost escalation and schedule overruns, the factors that were attributed to quality shortfalls in Zambia were rated and ranked using responses of each respondent group. A total of 17 factors were identified from literature and interviews during the study. The FII and corresponding rankings by each group of respondents is presented in Appendix II. The two tailed spearman rank correlation was also computed. Based on a 99 percent confidence interval, the critical value obtained from the statistical tables was 0.618. Except for the client/financier group, there was correlation between the rankings of the other respondent groups. Summaries of spearman rank coefficients are presented in Appendix II.

Based on PRAF and overall rank orders, the top five factors identified to cause quality shortfalls on construction projects in Zambia were found to be: poor financial management by contractors; inadequate and inconsistent release of project funds by clients; inadequate supervision by contractors; incompetence and lack of capacity by contractors to execute works; and clients lacking relevant knowledge. Table 6 presents overall rankings of factors attributed to cause quality shortfalls.

Table 5: Overall Ranking of Factors Attributed to Cause Schedule Overruns

S/N	Cause	Financier ranking	Client ranking	Consultant ranking	Contractor ranking	Sum of ranking	RAF	PRAF	Ranking order
1	Change order/scope changes	1	4	1	2	8	0.200	95%	1
2	Financial difficulties on the part of the Contractor	1	4	2	1	8	0.200	95%	1
3	Changes in Drawings & Specifications	1	4	8	4	17	0.425	89%	3
4	Delayed or non payment of IPCs	5	12	4	9	30	0.750	81%	4
5	Lack of qualified manpower	7	10	10	5	32	0.800	80%	5
6	Poor managerial skills	11	12	3	8	34	0.850	79%	6
7	Bad Weather (Floods or Heavy rains)	11	4	15	7	37	0.925	77%	7
8	Poor sub-contractor performance	1	1	32	3	37	0.925	77%	7
9	Inadequate review	11	12	5	10	38	0.950	76%	9
10	Inadequate scheduling	11	12	5	14	42	1.050	74%	10
11	Material procurement	11	12	7	13	43	1.075	73%	11
12	Equipment unavailability	11	12	13	11	47	1.175	71%	12
13	Staffing problems	10	8	9	21	48	1.200	70%	13
14	Poor coordination on site	11	12	11	18	52	1.300	68%	14
15	Schedule mismanagement	11	12	24	6	53	1.325	67%	15
16	Material fabrication delay	11	12	11	23	57	1.425	64%	16
17	Financial difficulties on the part of the Client	11	12	17	19	59	1.475	63%	17
18	Different site conditions	11	12	20	17	60	1.500	63%	18
19	Suspension of works	7	3	22	28	60	1.500	63%	18
20	Client's Financial processes	11	12	28	12	63	1.575	61%	20
21	Transportation delays	11	12	25	15	63	1.575	61%	20
22	Underestimation of productivity	11	12	19	22	64	1.600	60%	22
23	Inadequate planning	11	12	16	27	66	1.650	59%	23
24	Poor supervision	11	12	27	16	66	1.650	59%	23
25	Economic problems in the country	7	10	25	25	67	1.675	58%	25

Table 6: Overall Ranking of Factors Attributed to Cause Quality Shortfalls

S/N	Cause	Financier ranking	Client ranking	Consultant ranking	Contractor ranking	Sum of ranking	RAF	PRAF	Ranking order
1	Poor financial management by contractors.	1	2	1	2	6	0.353	91%	1
2	Inadequate and/or inconsistent release of project funds by clients.	6	1	5	1	13	0.765	81%	2
3	Inadequate supervision by consultants	1	6	4	4	15	0.882	78%	3
4	Incompetence and lack of capacity by contractors to execute works	1	6	3	5	15	0.882	78%	3
5	Client lacking relevant knowledge	5	3	2	9	19	1.118	72%	5
6	Long time lapse between assessment, procurement and implementation of the project.	7	6	6	3	22	1.294	67%	6
7	Incompetence of some Consultants	8	3	7	8	26	1.529	61%	7
8	Lack of project coordination by the client, contractor and consultant	4	10	8	7	29	1.706	57%	8
9	Disruption of project management continuity	8	6	13	6	33	1.941	51%	9
10	Inadequate project planning	8	10	10	10	38	2.235	43%	10
11	Inadequate/wrongly applied specifications	11	10	11	11	43	2.529	36%	11
12	Corruption and demand for kickbacks by Consultants prior to certification of works.	14	5	12	13	44	2.588	34%	12
13	Local government pressures	11	10	9	15	45	2.647	33%	13
14	Inadequate inspections	11	10	15	12	48	2.824	28%	14
15	Project location	15	10	14	14	53	3.118	21%	15
16	Poor sub-contractor performance	16	10	16	16	58	3.412	13%	16
17	Size of project	16	17	17	17	67	3.941	0%	17

DISCUSSION OF RESULTS

The results of the study presented in this paper confirmed high levels of prevalence of cost escalation, schedule overruns and quality shortfalls in the Zambian construction industry. Taking an 80 percent PRAF as a cut-off point, the most common and severe causal factors to poor delivery of construction projects were grouped into four categories: poor financial planning and management; poor change management; lack of capacity; and poor schedule management.

Poor Financial Planning and Management

Poor financial planning and management factors that hinder improved delivery of construction projects include: insufficient initial cost estimates or inadequate allocation of funds; effect of inflation; inconsistent release of funds by clients or delayed settlement of IPCs; and poor financial management by contractors.

Inadequate cost estimates are normally attributed to poor estimation practices. They could be as a result of the engineers' estimates being much lower than bid prices or the adoption of the lowest responsive financial offers made at tendering stage. Inadequate cost estimates were uniquely identified in the study reported in this paper and not from previous studies reported in literature.

Inflation was also identified to be a major contributor to cost escalation. This was in agreement with studies by Apolot et al. (2012) in Uganda and Azhar and Farouqui (2008) in Pakistan. Bids in Zambia, especially by local contractors, rarely took into consideration effects of inflation. This could pose serious financial challenges especially in years where annual inflation rates exceeded the Gross National Product (GNP) growth rate.

Inconsistent or delayed release of funds by clients lead to cost escalation and schedule overruns. Delayed payments almost always results in increased project costs because the risk is transferred to clients who have to bear the burden of interest payments. This result confirmed findings by Apolot et al. (2012). On the other hand, poor financial management by contractors also lead to schedule overruns and quality shortfalls. When contractors exhibit poor financial management practices, they run the likelihood of running out of funds to enable them execute project activities. Running out of funds puts contractors in a position that could tempt them to 'cut corners' or delay project deliver.

Poor Change Management

Variation orders and changes in drawings and specifications constitute change management factors. Variation orders have significant impact on cost escalation and schedule overruns. This is consistent with the findings by Apolot et al. (2012) in Uganda, Kaliba et al. (2009) in Zambia, Azhar and Farouqui (2008) in Pakistan and Ahmed et al. (2002) in the USA. Poor change management in carrying out variation orders normally lead to increased project costs and schedule overruns.

Poor schedule management

Another driver of cost escalation identified in this paper was schedule overrun which was consistent with the findings by Merewitz (1973) and Mansfield et al. (1994).

Since one in every four projects experienced schedule overrun ranging between 10 and 50 percent, the knock-on effect would be cost escalation. Proper schedule management would, therefore, minimise cost escalations on construction projects.

Lack of Capacity among Contractors

Shortage of qualified and experienced human capital among contractors was ranked among the major causes of quality shortfalls. Generally, lack of capacity among contractors lead to quality shortfalls and consequently cost escalation as well as schedule overruns. This was identified from literature. The study by Ramanathan et al. (2012) confirmed this to be true in Malaysia as well. Thus lack of capacity among contractors appears not to be unique to the Zambian construction industry, but could also be afflicting other countries worldwide, especially those in the developing world.

CONCLUSIONS AND RECOMMENDATIONS

Cost escalation, schedule overruns and quality shortfalls in construction are potential obstacles to the successful delivery of projects. The study reported in this paper established that there are a number of causal factors which need to be adequately dealt with if cost escalation, schedule overruns and quality shortfalls are to be minimised on construction projects in Zambia. Despite being a subject of discussion over several decades, cost escalation, schedule overruns and quality shortfalls still persist on construction projects. The results reported in this paper could help project managers and owners understand and manage factors that significantly cause cost escalation, schedule overruns and quality shortfalls on construction projects.

The results presented in this paper suggest that practitioners in the Zambian construction industry should endeavor to improve project finance planning and management. Whenever possible, initial project analysis should provide clients with sufficient details that can be used as a basis for contracting out projects. Project cost estimates should also take into account escalations that could result from inflationary changes.

There is need to improve change management processes in the Zambian construction industry. Variation orders on construction projects are often inevitable. However, change orders should be carefully managed in order to ensure that intended benefits that necessitated such variations accrue to projects.

The factors that impede successful project delivery identified in this study need to be investigated and understood by managers in order to address persistent challenges of cost escalation, schedule overruns and quality shortfalls on construction projects. Should cost escalation, schedule overrun or quality shortfall occur on a project, the likely effect would be to offset objectives and failure to meet project delivery requirements.

REFERENCES

ACEZ (2012) www.acez.co.zm [Accessed 07/10/2012]

Ahmed S., Azher S., Castillo M. and Kappagantula P. (2002) Construction delays in Florida; an empirical study, Florida, available online: www.cm.fiu.edu/publication/Delays %20project.pdf [Accessed 20/3/2008]

Al-Moumani H. A. (2000), Construction Delay: A Quantitative Analysis, International Journal of Project Management, Elsevier, 18(1), pp. 51-9

Apolot R., Alinaitwe H., and Tindiwensi D. (2012), An Investigation into the Causes of Delay and Cost Overrun in Uganda's Public Sector Construction Projects, Proceedings of the Second International Conference on Advances in Engineering and Technology, India.

Assaf, S, AL-Khalil M. and Al Hazmi M., (1995), Causes of delay in large building construction projects, Journal of Management in Engineering, 11(2), pp. 45-50.

Azhar, N. and Farouqi, R. U. (2008), Cost Overrun Factors in the Construction Industry of Pakistan, In the 1st International Conference on Construction in Developing Countries: Advancing & Integrating Construction Education, Research and Practice, Karachi, Pakistan.

Bank of Zambia (2011), Annual Report, Bank of Zambia.

Chan D. W.M and Kumaraswamy M. M. (1997), A comparative study of causes of time overruns in Hong Kong construction projects. International Journal of Project Management, Elsevier 15(1), pp 55 – 63.

Datta B. (2002) Management of Infrastructure Projects in Urban Local Bodies: Case Study of Kanpur Development Authority, India Infrastructure Report, pp. 207 – 211.

Dlakwa, M.M. and Culpin, M.F. (1990). Reasons for overrun in public sector projects in Nigeria. International Journal of Project Management. 8(4), pp 237-241.

Elinwa A. U., and Buba S., A., (1993), Construction cost factors in Nigeria, Journal of Construction, Engineering and Management, ASCE, 119(4) pp 419 – 425.

Elinwa A. U., and Joshua M., (2001), Schedule overrun factors in Nigerian Construction Industry, Journal of Construction, Engineering and Management, ASCE, 127(5) pp 698 – 713

Falqi I. I. (2004) Delays in Project Completion: A comparative study of construction delay factors in. Saudi Arabia and the United Kingdom, available online: http://www.saedin.com/index.php?option=com_docman&task=doc_download &gid=48&Itemid=57 [Accessed 5/6/2008]

Frimpong Y., Oluwoye J., and Crawford L., (2003), Causes of delays and cost overruns in construction of groundwater projects in a developing country; Ghana as a case study, International Journal of Project Management, Elsevier, 21, pp 321 - 326

Hendrickson C., Au T., (2003), Project Management for Construction: Fundamental Concepts for Owners, Engineers, Architects and Builders, Version 2.1, Pittsburgh available online: http://www.ce.cmu.edu/pmbook [Accessed 21/2/ 2006]

Kaliba C., Muya M., and Mumba K., (2009), Cost escalation and schedule delays in road construction projects in Zambia, International Journal of Project Management, Elsevier, 27(5), pp 522 - 531

Kasimu M. A. (2012), Significant factors that causes cost overruns in building construction project in Nigeria. Interdisciplinary Journal of Contemporary Research in Business, 3(11), pp 775 – 780.

Mansfield N. R., Ugwu O. O. and Doran T. (1994), Causes of delay and cost overruns in Nigerian construction projects. International Journal of Project Management, Elsevier, 12(4), pp. 254 – 260.

Merewitz, L. (1973) "Cost Overruns in Public Works." Benefit Cost and Policy Analysis Chicago, Aldine, pp. 227-297.

NAP (2003) Completing the Big Dig; Managing the Final Stages of Boston's Central Artery/Tunnel Project, The National Academies Press, Washington, D. C. Available online: http://www.darwin.nap.edu/books/0309088879_ht [Accessed 5/6/2008]

NCC (2012) www.ncc.org.zm [Accessed 07/10/2012]

NCC (2006) Contractor Failure Workshop, Construction News, Volume 7(3), pp 3

Nkhata L. (1997), Methodological Options in Policy Relevant Social Research, Study Fund, Lusaka, pp 77 – 170.

Ramanathan C., Nayaranan S., and Arazi I. (2012) Analysis of Time and Cost Overrun in Malaysian Construction, Advanced Materials Research, 452-453, pp 1002 – 1008.

Schexnayder C., Fiori C., and Weber S. (2003) Project Cost Estimating; A Synthesis of Highway Practice, Arizona. Available online: http://www4.trb.org/trb/crp.nsf/All+Projects/NCHRP+20-7 [Accessed 5/6/ 2006]

The Post (2008) "Simbao warns contractors", January 10, pp 1