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Managing the Drivers of Cost Escalation in the Road Development Sector: An Overview

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Abstract: The management of construction cost escalation requires that proponents understand the drivers of project cost. The aim of this research was therefore to evaluate the causes of project cost escalation with a case study in Ghana. The research was carried out using quantitative approach by distributing questionnaires to built-environment professionals and stakeholders in the road sector. Findings suggest that fluctuations in cost indices, variation in work due to incomplete scope definition, corruption, unstable exchange rate, schedule delays, and poor risk management are the major key drivers affecting cost escalations on road projects in Ghana. The study held that the lead times allowed between base dates of estimates, actual award and commencement date of the project has a contributing factor for cost escalations. To manage cost escalation, the challenge of incomplete scope definition and instability in micro economic indicators must be managed by the players of the economy. To curtail corruption, the procedures for the awarding of contracts which are subjective with public officials having discretions to determine the least evaluated bidders even though there are procedures for determination, must be reviewed. The use of such discretionary powers accounts for perceived corruption along with contractor behaviour resulting in under dealings. The bidding and award stage of projects mark the beginning of interaction between public official and contractors and hence, the hatching point for project corruption. It is recommended that the management of cost escalation would require the improvement of the governance structures and procurement process for public sector projects. The conclusion of the survey suggests that a holistic approach is required to control the trend but more importantly, on attitudes of officials involved which would require improved ethical commitment.

Keywords: Road Projects, Cost Escalations, Risk Management, Cost Growth, Construction, Civil Engineering

1. Introduction

Cost escalation on road transport infrastructure projects has in recent times become a bane for sponsors and contractors of these projects to contain, resulting in late payments and derailing the nation budgets. It is critical therefore, to derive methods to both quantify and manage cost escalation on individual projects for owners and contractors in order to ensure that there are sufficient funds to deliver the final program in budget and on schedule. This paper details methods by which participants on construction projects can track the extent of escalation and work together to minimize the impact of cost escalation on the success of a project. In order to manage escalation on road construction projects, it is first important to understand the driving forces behind its causes. This is especially critical in the current situation, where price fluctuations have been so volatile that it has been difficult to predict or estimate what bid prices might actually be (Douglas, 2010).

The most important factor is that construction must be viewed as a commodity in itself, not a collection of commodities. The selling price of a project is not the result of the sum of its inputs plus a profit, except in the very rare cases where all work, including sub-contracts, is procured through a cost-plus contract. In all other cases, the selling price of a contract is determined by the bidders based on their opinion of

the competition. The sum of the input costs will provide a floor below which a bidder is normally unwilling to go, and thus changes to input costs will influence bids to some degree. The ceiling is, however, set by the bidder's opinion of the competition and the keyword here being "opinion"(Morris & William, 2006). The bidder must not only estimate their own costs, but must also estimate what the other players will do.

One further consideration is that of risk. Buertey (2014) posits that risk management is critical towards the achievement of project success and must be managed coherently. Strictly speaking, this has to do with the inputs or efforts in delivery of the product, since it relates to how input costs might vary and whether materials will be available at the estimated prices?, Will labor productivity match the estimate?, Can sufficient labor be found? Are there predicted and unpredicted uncertainties along the project trajectory? Risk increase is directly proportional to the below which bidders are unwilling to go. As risk increases, so does the floor below which bidders are unwilling to go. Risk is very difficult to estimate, and few bidders do it systematically. Risk assessments are usually heavily influenced by short term perceptions based on the latest news, and as a result are often very inaccurate. Escalation therefore comes from the interplay of changes, real or anticipated, input costs, perceptions of risk, and perceptions of the competition. In some cases it comes from real information, such as actual changes in the cost of critical materials like steel or copper or cement. More often than not, however, it comes from the formation of market opinions, which may or may not have a basis in real world. Ultimately, the ability for contractors to raise prices depends entirely on the market conditions, and the expectation that all bidders are increasing their prices. Increased input pricing and increased risk can influence that expectation, but cannot on their own increase prices. There is no such thing as a "pass through."

Cost escalation in road and civil engineering works can be caused by a number of factors ranging from design changes to high cost of materials, labor and machinery and unstable global economic indicator. Interestingly, as construction cost escalates, all budgetary and fiscal plans are thrown into chaos causing construction markets to suffer unpredictability (Dawood et al., 2001). One key factor that affects escalation is the tight construction market. Thus, it has been established that the global construction business is substantially busier today than it was just a few years ago. When the market is busy and contractors' surplus capacity is absorbed, then prices can be expected to rise. Morris and Wilson (2006) conjectured that, assuming that engineers' estimates are reasonably accurate, competitive tenders should result in lower prices, and hence lower overruns. The intensity of competition can be measured along two dimensions: the number of bidders and the spread of the bids. It is generally agreed that at least three technically qualified bidders are needed to provide adequate competition, and that the price spread should be such that the lowest three bidders fall within a 10 percent range. It has also been held, that the single strongest explanatory factor is the absence of meaningful tender competition, which affected 78% of projects. Their findings implied that there is no single solution to the problem of project cost overruns, but that any solution will need to address the different causes that have been identified (Peter & William, 2006).

The unique characteristic of the construction industry is epitomized in every project. This has affirmed that every project is different, a situation which emanates from the project's own characteristics, that is, its type, its size, its geographic location, personnel involved in the project, those emanating from the other subsystems within the industry, and also those from the super-system. Project execution is inherently risky and the lack of appropriate approach to addressing these risks has led to a lot of undesirable results in the construction industry mostly in developing countries. Traditionally, this is seen in the failure of the project to achieve its key deliverables in cost, time, quality and other targets due to inefficiencies in the execution the process. This ultimately, causes client dissatisfaction. A common challenge that affects project performance in the industry is low productivity (Peter & William, 2006).

2. Methodology

The approach used in doing this work was broken down into quantitative and qualitative methods through desktop study through literature, field survey through administering of questionnaires and interviews, observation and statistical analysis of results, deduction of findings and conclusion.

2.1. Data Collection

With the main objective being the determination of major drivers to cost escalation of road projects and recommend modalities to manage cost growth on road projects in Ghana, quantitative method was used. A total of 80 online questionnaires were posted to email addresses of individual respondents from the Ghana Highway Authority, the Department of Urban roads, the Department of Feeder Roads, contractors, consultants, the works department and other developing countries' road agencies. Out of the 80 questionnaires sent, 46 respondents completed and returned their questionnaires. This represents a response rate of 57.50%, which is above average. Naoum, (2007), suggests that an acceptable survey for studies should have a response rate of not less than 50%. There is no specific rule on what is the best rate of response for a good research report. Thus, one may argue that the response rate for this research is therefore acceptable.

2.2. Analysis

To determine the most significant factors that affect cost escalation in road project, 26 factors were tabulated for respondents to rate on a likert scale of 1-5, with 5 being high and 1 being low. Multivariate statistical analysis was used by means of estimation of the modes, means, average-deviations, z-tests, relative important indices to rank each factor using their respective Likert scale rating response data. This analysis

was carried out to determine the relative importance of the variable and the weight of their influence on the proposed framework to be developed. The mean, mode and modal ratings were developed.

The modal rating of a factor is determined as a ratio of the mode frequency and the total number of responses. The modal score of the responses is determined to ascertain the most popular score among them for each of the variables considered for each question. The mode is the most frequent occurring value in the set of values. The percentage of modal frequency was determined by

The mean rating is the average of the score for a particular variable. This together with the mode and median, referred to as the central tendency of dispersion and used to provide a better understanding of what is the opinion of the respondent.

This provides an idea about the absolute deviation of a data from the mean. It is a measure of variability in the data set (the consistency of opinion or score of the respondent). The scale of this value is influenced by the unit measurement, but the scores in this analysis are absolute values (they have no unit of measurement), hence this distortion is eliminated. This statistics was employed to ascertain the consistency in opinion of several respondents on the influence of a particular variable.

The sample mean for the data in respect of each factor and the effect of variation are shown in the table 1. The 5-point rating (1, 2, 3, 4 and 5) have a mean of 3 with a standard deviation of 1.58. The p-value for the test was determined to find out if there was much difference between the null value of $\mu=3$, and the sample means in table 1 to cause the rejection or acceptance of the factors. The profitability of observing the sample mean or larger $\mu = 3$ and $\sigma = 1.58$ was computed. The test statistics (X) was the central limit theorem, where x is approximately normally distributed with mean $\mu = 3$ and Standard Deviation, $\sigma/\sqrt{n}$ where n = number of responses for that factor. The p-value was obtained using the relation below.

From the cumulative distribution standard normal table, where $Fz(z) = P[Z \leq z]$, the value of z ranges from -3.9 to 3.9. Any value of z less than -3.9 has a Fz(z) of zero (0) whereas values of more than 3.9 has Fz(z) of unity (1). The p-value is the smallest level of significance for which the observed data would call for rejection of a factor. The p-value gives additional insight into the strength of the decision taken. Thus, a relatively small p-value of 0.001 indicates that there is likelihood that the acceptance of a factor holds true. On the other hand, a high p- value such as 0.2033 means that the factor must be rejected as having an insignificant effect on the cost escalation factors. Thus, the P-value is often referred to as the observed level of significance for a given level of significance, α.

3. Results and Discussions

From table 1, using relative importance indices, it was observed from field survey that 9 factors were ranked as significant or highly relevant factors affecting cost escalation. These factors are:

- Fluctuation in cost indices
- Variation of work done due to poor scope definition
- Corruption by implementing agencies and government officials
- Unstable exchange rate
- Schedule delays
- Delay payment and project financing problems
- Procurement management challenges
- Poor design management, planning and risk management
- Lack of project monitoring and controlling
- Political influence

Based on the field studies, it was established that economic and financial factors accounted for unstable price indices resulting in fluctuation in cost. Changes in micro economic indicators and market volatility results in consistent rise in prices of construction materials, equipment and labor cost thereby, affecting input cost and hence resulting in project cost escalation. It was observed at 5% significance level with a p-value of 0.003 that price fluctuation is the most significant factor affecting road projects. In the report of the African Development Fund for the supplementary loans for the Tema-Aflao road, Akatsi-Akanu road program in Ghana, Ehuman & Rao (2008), cited that the project cost overrun in Ghana was largely due to the unforeseen global general price hike of petroleum products and other road construction materials and notably the rise in labor costs which significantly impacted severely cost indicators of the road construction works.

Morris and Wilson (2006), postulated that the cost overruns observed in recent road sector projects can be traced to various causes, including balance of evidence. Domestic inflation and currency appreciation affected several projects, but they show only weak causality, having played a part in only 27% of the observed overruns. The tightening of the construction industry is slightly more important, figuring in 32% of observed overruns. The increase in international oil price and the knock-on to domestic diesel prices had a larger impact affecting 45% of cases.

Again, respondents established that variations in on-going work being technical, construction technology, designs and materials was the second most significant factor affecting cost escalation. With a p-value of 0.008, respondents observed that variation in on-going works affected the value of the final product by 50-100% of the contract sum. These variations emanate from incomplete scope definition, poor design and lack of comprehensive feasibility studies on the part of implementing agencies. Based on a study by Ismail et al., (2012) in Malaysia, it was established that financial design changes was a critical factor that affected cost escalation.

Respondents established from field studies that corruption was the third most significant factor, affecting cost escalation in road projects. With a P-value of 0.004, it was established that the implementers and contractors used various means to escalate the cost of procuring infrastructural projects. Based on additional field data gathered, over 80% of the respondents were of the view that cost escalation is widespread in the road infrastructure sector and by extension can be also attributed to

corruption. These findings confirm research studies by Transparency International and the American Society for Civil Engineers' survey on perceptions of corruption in the industrial sector. It is also consistent with (Mensah, 2003) survey on corruption in Ghanaian economy.

The procurement process for projects is mostly shrouded with some gloom and lack of transparency. The time interval between initiating tenders, award of contract and project commencement is always unreasonably long and a breeding period for various corrupt practices. In this same report, Ehuman & Rao (2008) held that during the procurement phase, projects are initiated long before the actual construction works commence. Thus, construction cost can escalate so much that it can affect the original scope of work and base rate of inputs for the project. A comparison of the initial project cost and the cost at the time of implementation; shows almost 50% variance.

According to the Global Infrastructure Anti- Corruption Centre (2011), the greatest challenge to the development of adequate and safe road networks in developing countries, particularly sub-Saharan Africa and South East Asia, are primarily due to theft and grand scale corruption. The inability to address issues of corruption alongside the above challenges means that developing countries will continue to face financial challenges and may not be able to effectively deliver the expected outcomes from road projects. The road density comparison of Africa's 3.6km per 1000 persons with 7km per 1000 persons as a global requirement depicts the fact that not only does quality matter but also quantitative measures need to be envisaged to close road infrastructure deficits. According to the Transparency International's conservative estimates in 2005, it is suggested that 10-20% percent of global construction cost is lost annually through bribery, fraud and corruption, which has direct consequences for the funding and quality of road projects. In this regard, cost escalation in the sector is one aspect which needs to be effectively addressed to minimize the effects of high cost of road projects.

During bidding and award stage, contractors employ several techniques to outwit public officials. For instance, contractors collude to buy bidding documents and redraw their bids or enclose insufficient/defective documents to favor a specific firm (Price Water House, 2009). Some consultants or implementing agencies also give tender documents with inflated quantities and prime cost sums to firms that they want to disadvantage skewing the tender process in favour of companies that have bribed them. Cost escalation measured at this phase should aim at limiting such activities. Punitive clauses should be included in bidding documentations and contractors made to commit to it. Clauses should include suspension or blacklisting contractors, consultants, manufacturers and suppliers from participating in government projects if they are found to breach these clauses. Other measures to prevent such practices during the bidding and award phase is to foster transparency in the processes by including civil society organization during the bidding and evaluating stage. This will improve transparency in the bidding process, enable competition and provide value for money (Procurement Watch Incorporated, 2009).

Politicians and high ranking civil servants in developing countries are major stakeholders in allocating these rights. On the other hand, low salary was not generally considered major issues but rather greed. These results are consistent with Baker (2005), who investigated the relationships between corruption and low wages in the civil service and suggested that relative pay has no significant effect on corruption. However, any anti-corruption measures adopted must effectively address such issues because overelaboration of one aspect of corruption can induce other aspects. Overall, the bid and award stage of the project lifecycle phase was viewed as the most likely phase to attract bribery, fraud and collusion. The findings show a direct correlation with the funding options, which respondents viewed as most susceptible to corruption. It is also the case that developing countries continue to execute projects using the traditional approach to procuring contractors and supplies. However, the research did not find if there are indications to suggest that the level of investment within the project management lifecycle influences cost escalation (Ghulam, 2007).

While the implementation phase of road projects accounts for a higher proportion of investment, corruption is lower within the phase. This implies that procurement methods adopted significantly influence the bidding processes and determine the awarding of contracts. Researchers, including the Institute for Civil Engineers (United Kingdom) suggest similar outcomes in a survey to determine corruption levels in the construction industry in the United Kingdom. The types of funding options also suggest that the level of corruption in the road sector does not relate to the size of contract sums of projects, though large contract sums can serve as a catalyst for corrupt practice to emerge. The findings suggest that cost escalation depends on opportunities, and where projects are effectively monitored, cost over-runs is reduced. Based on analysis and experience from developing countries, donor-funded projects have been shown to constitute the largest investment in the sector. Interestingly however, the findings suggest that there is a wider gap between the perceived levels of funding for locally funded projects and donor projects. International donor funds, which are often subject to stringent monitoring and evaluation, coupled with the level at which contractors perceive international projects in terms of demand for quality and others see less corrupt practices compared to local government funded projects. Reasons for this could include; local institutional weaknesses and limited personnel in the sector together with personal interest of awarders of contract which lead to high corruption within the sector (Messick, 2011).

The high rate of response from the professional sector in relation to corruption further illustrates that, they may be under constant pressure from the public in matters of cost escalation resulting from corruption because of their leading role in the industry. This is consistent with the assertion from the literature that societal pressure significantly affects people's attitudes towards corruption.

Table 1. *Ranked Factors Affecting Cost Escalation in Road Projects in Ghana.*

Item	Risk Factor	Mode	Mode Freq	Rating < Mod Freq	Rating > Mod Freq	Mode <= Mod fr	Total Response	Mode %	%Rating < Mod Freq	%Rating > Mod Freq	%Mode <= Mod fr	Mean	Average Dev	Interprt of Mode	Rel Imp Indx	Rank	p-value
1	Force Majeure conditions	3	17	19	16	30	46	0.370	0.413	0.348	0.652	2.174	0.242	IR	1.333	19	0.249
2	Delayed payment for certified work	3	19	27	34	45	46	0.161	0.587	0.739	0.978	4.283	0.379	VR	2.627	6	0.075
3	Schedule delays	2	24	12	50	27	46	0.203	0.261	1.087	0.587	4.370	0.424	VR	2.680	5	0.016
4	Delay in answering queries	2	24	16	15	35	46	0.000	0.348	0.326	0.761	2.217	0.265	IR	1.360	18	0.412
5	Environmental cost	2	17	15	5	34	46	0.144	0.326	0.109	0.739	0.543	0.073	IR	0.333	22	0.411
6	Legal Cost	2	25	4	1	8	46	0.212	0.087	0.022	0.174	0.196	0.046	IR	0.120	23	0.256
7	Fluctuation Cost	5	23	66	0	95	46	0.195	1.435	0.000	2.065	6.087	0.392	HR	3.733	1	0.003
8	Social Cost	3	24	44	6	63	46	0.000	0.957	0.130	1.370	1.891	0.457	VR	1.160	20	0.241
9	Reworks and Defects	2	23	28	34	44	46	0.195	0.609	0.739	0.957	2.913	0.438	MR	1.787	16	0.175
10	Material test records / Documentation	2	24	18	0	41	46	0.203	0.391	0.000	0.891	0.109	0.018	IR	0.067	24	0.525
11	Service test records	1	24	2	1	2	46	0.203	0.000	0.022	0.043	0.087	0.020	IR	0.053	25	2.83
12	Variation of certificates	4	25	65	22	65	46	0.212	1.413	0.478	1.413	5.587	0.359	HR	3.427	2	0.005
13	Arbitration	1	13	4	2	2	46	0.110	0.087	0.043	0.043	0.087	0.028	IR	0.053	26	0.95
14	Competence and Commitment of project team	4	24	37	14	37	46	0.000	0.804	0.304	0.804	3.174	0.217	MR	1.947	14	0.575
15	Contractual claims	4	18	41	15	41	46	0.153	0.891	0.326	0.891	3.609	0.230	HR	2.213	11	0.893
16	Urgency for completion	1	16	0	19	9	46	0.136	0.000	0.413	0.196	1.217	0.155	IR	0.747	21	0.455
17	Cover pricing	3	23	13	20	23	46	0.195	0.283	0.435	0.500	2.391	0.202	MR	1.467	17	00.10
18	Unstable exchange rate	3	17	16	39	35	46	0.144	0.348	0.848	0.761	4.391	0.329	HR	2.693	4	0.006
19	Project Planning and risk management	3	24	27	31	46	46	0.000	0.587	0.674	1.000	4.196	0.368	HR	2.573	8	0.008
20	Corruption	4	18	56	18	56	46	0.153	1.217	0.391	1.217	4.413	0.328	HR	2.707	3	0.008
21	High interest rate	3	28	20	26	37	46	0.237	0.435	0.565	0.804	3.348	0.307	IR	2.053	12	0.512

Item	Risk Factor	Mode	Mode Freq	Rating < Mod Freq	Rating > Mod Freq	Mode <= Mod fr	Total Response	Mode %	%Rating < Mod Freq	%Rating > Mod Freq	%Mode <= Mod fr	Mean	Average Dev	Interprt of Mode	Rel Imp Indx	Rank	p-value
22	Project monitoring and control	3	23	16	31	34	46	0.195	0.348	0.674	0.739	3.761	0.296	HR	2.307	9	0.009
23	Political influence	1	24	0	57	24	46	0.203	0.000	1.239	0.522	3.630	0.440	HR	2.227	10	0.475
24	Depreciation of local currency	4	30	52	10	52	46	0.254	1.130	0.217	1.130	3.304	0.301	MR	2.027	13	0.494
25	Procurement management	3	24	42	30	59	46	0.203	0.913	0.652	1.283	4.217	0.468	HR	2.587	7	0.009
26	Estimation errors/ method	3	18	23	25	41	46	0.237	0.500	0.543	0.891	3.152	0.346	MR	1.933	15	0.349

The unstable foreign exchange rates and unreasonable schedule delay were identified as the fourth and fifth significant factors that affected cost escalation in Ghana. In a study by Baiden-Ammisah (2000) cited in Buertey (2011), held that at 95% level of significance, all projects executed in Ghana under the local government suffered schedule delay. In a research by Frimpong, Oluwoye, and Crawford (2003) to assess the relative importance of the causes of delays and cost overruns in Ghana groundwater construction projects, the research showed that monthly payment difficulties from agencies, poor contractor management, material procurement, poor technical performances, and escalation of material prices were the main causes in the study.

Morris and Wilson (2006) posited that nearly all of the projects they sampled in a survey experienced delays in implementation from the date anticipated in the project appraisal reports. The delays ranged from one to five years but averaged 22 months for the sample as a whole. The longer it takes to procure materials and execute a project, the greater the chance that costs and prices will increase with respect to the effect of both general price inflation and changes in the prices of specific inputs, notably oil. Oil prices affect road construction through two channels: the cost of direct inputs and the cost of transportation. The price of bitumen (asphalt), a key material in road construction, tracks the price of petroleum very closely. Since 2002, international cost indices show increases of between 80 to 120 percent in the price of bitumen, hot mix, paved concrete, and other key materials used in road construction.

Another factor identified by project implementers as a key factor resulting in cost escalation is delays in payment of work certified arising out of challenges of adequate project financing. Buertey et al., (2011), established that contractor cash flow challenges resulted in delays in payment of over 30months causing undue schedule delays which results in serious project cost escalations. The Construction industry undoubtedly requires huge financial commitment to accomplish its outcomes. The need for heavy machinery/equipment and new technology are characteristics of the industry, which places high demand on huge financial investment in the sector to meet its objectives. Research studies have shown that the construction industry is by far the largest sector, accounting for huge spending over the decades. A report compiled by the World Bank in 2009, suggested that the construction industry accounted for about $1.7 trillion, representing 5% to 7% of GDP of most countries, and total investment in the road sector within the same period accounted for between 2% to 3.5% of GDP in most countries (Kenny, 2009). According to Messick (2011), the World Bank alone lent out close to $56 billion for road infrastructure projects between 2000 and 2010 representing about one fifth of the bank's total lending to all sectors of the economy, suggesting that huge financial investment into road infrastructure is required to accelerate growth of the sector. The Africa Review Report on Transport, by the Economic Commission for Africa (2009), also suggests that Africa requires an estimated $14.2 billion annually to meet transport infrastructure gaps with as much as $6.4 billion for the 13 Sub-Saharan African countries.

4. Conclusion

Based on the field studies, respondents see close correlations among the various factors influencing cost escalation. There were no wide discrepancies in the results to suggest that one single factor accounted for a significant proportion of cost escalation in road projects. However, activities that require control by supervising agents and officials cumulatively accounted for a larger proportion of cost escalation factors. These included lack of transparency, political influence, use of discretional powers and inability to enforce laws and regulations.

NZIR (2014) holds that factors that affect cost growth on road construction projects could be grouped into three. These include factors that transport policy makers have no influence upon, factors transport policy makers may influence and factors within control of transport policy makers. These are further elaborated below:

a. Factors that transport policy makers have little or no influence upon include:
- changes in overall demand for civil construction services (broadband, electricity transmission and distribution, irrigation etc.)
- import cost increases: bitumen price increases, capital goods price reductions

b. Factors transport policy makers may influence include
- procurement approach
- locally sourced input cost: quarry aggregate and labour cost increases
- structure and conduct of markets
- the wider regulatory environment
- weak industry productivity growth

c. Factors within control of the transport policy makers
- how expenditure on service level improvements is accounted for leading to apparent cost increases which are actually service additions
- risk management and productivity incentives
- standards and guidelines that may improve transport service levels, but
- increase costs may at times constrain innovation and productivity

In another study by Hanes (2015), it takes the concerted effort of the project team and policy makers to manage cost escalations. According to the study, cost escalations may be improved using a matrix of the factors below:
- Restructure the procurement entity and activity classes to increase transparency: service level
- improvement versus cost increases

Disclose market information routinely which includes:
- Improve monitoring for the possibility of collusion
- Expose suppliers to market signals
- Improve practice for standards and guidelines
- Review procurement strategies in light of their impact on the structure, conduct and performance of localised markets

Kaliba et. al., (2009), from a study in Zambia established that bad or inclement weather due to heavy rains and floods, scope changes, environmental protection and mitigation costs, schedule delay, strikes, technical challenges, inflation and local government pressures were the major causes of cost escalation in Zambia's road construction projects. It was recommended that to curb escalation in cost in the road sector, appropriate project management practices are thus required. The result of this research was corroborated by Kalibe et al., (2009).

During project execution or implementation, agency staffs are most likely to impede progress of payment certification. One way to avoid such incidents is to implement a Document Tracking System. The system should enable tracking of quality control measures, project reporting and particularly payment certificates. The efficiency of such a system will limit opportunities for agency staff to derive rent from such processes but rather affecting the client who will in turn have to pay for interest payment. The use of external evaluators to monitor and audit contractor performance during and after projects implementation will further reduce opportunities for agency staff to conceal poor quality works thus, reducing the functional life of the deliverable leading to extra cost for repairs. The road sector needs to develop a sector scorecard that will rate contractors' performance and encourage healthy competition in the sector. The rating of a contractor should be based on previous performance, and used as basis for qualification for future projects. For instance, if a contractor shows poor performance consecutively or has a poor rating particularly on delays and poor quality, such a contractor should be suspended for a period of time by a committee set up for such purposes. The rating and penalties must however be transparent to ensure credibility and acceptability by all stakeholders.

Morris and Wilson (2006), posits that a fundamental tool in managing escalation is high quality cost management. This involves development of a realistic cost model with appropriate recognition of risk, regular cost monitoring throughout the project, and a commitment to address issues as they arise. The keys to successful cost planning & management are high quality information and good communication.

Since the findings suggest that project participants influence the level of corruption resulting in adverse cost impacts or otherwise in the sector. It has been suggested that any cost control measure aimed at reducing the effects of cost escalation due to fraud should target project participants, and systems should be put in place to provide efficient information flow at all stages of the project lifecycle phases.

Based on the framework in table 2, it is proposed that to minimize escalation, Public officials and all other project stakeholders in developing countries, in the construction industry and in the road sector in particular, should strive to undertake projects with the aim of achieving the required outcome and meeting the needs and expectations both of the communities in which the projects are being carried out and of the wider public. To attain these goals, public officials should ensure transparency and free flow of information to all project stakeholders and to the public.

Project management procedures must be strictly adhered to in all processes, and should aim to meet all statutory and contractual obligations, especially on issues related to effective coordination and monitoring of the road sector. Governments should exert a positive influence in all aspects of the sector by motivating and retaining professionals in the sector. Training and other carrier development strategies should be seen as a way of improving professional integrity and making staff aware of the consequences of cost escalation or corruption in the sector. This should be directed not only at staff in the road sector, but to contractors, consultants and other essential players in the industry.

Table 2. *A framework to minimize escalation of project cost.*

Action by	Actions-description	Effects/Consequences
Funder/Client	Ensure that no member of the team engages in corrupt practices.	Contractual liabilities and financial consequences
Implementing Agency	Enforce provisions of the Procurement Act and strict adherence to same by all entities	Discontinuation of project
Implementing Agency	Ensure proper feasibilities and project planning are conducted to enhance efficient post contract implementation	Contractual liabilities and financial consequences
Funder/Client	Isolate non-compliance of laid-down procedures, whether wilfully or blindly or recklessly, or aiding and abetting.	Criminal liability and cost
Funder/Client	Enhance prompt or timely payment of claims. Enforce auditing, reporting and training procedures and ensure compliance.	Criminal liability and cost
Funder/Client	Ensure bonuses and incentives to employees or ensure effective monitoring to prevent fraud.	Financial consequences
Funder/Client	Encourage employees to report cases of corruption or identify and avoid corrupt activities by offering awards to whistle blowers.	Financial consequences
Funder/Client	Undertake due diligence on key staff/employees, financial transactions, key project participants, agents and intermediaries and the project in general.	Financial consequences
Funder/Client	Ensure staffs avoid conflicts of interest; make sure staffs are aware of their responsibilities and limitations.	Criminal liability and cost
Funder/Client	Encourage competitive bidding at all times to minimize abuse of single sourcing.	Financial consequences
Funder/Client	Enhance transparency and effective flow of information on project activities to all interested stakeholders and public.	Reduce project participants motivation for corruption
Funder/Client	Ensure collective decision-making with beneficiary community and disclose project activities including all financial transactions.	Reduce project participants motivation for corruption
Funder/Client	Ensure that all contract documents include an anti-corruption clause and compel contractors to abide by it. It should be enforceable and the client should be able to claim compensation if it is breached. This may include debarment of contractors from participation in subsequent projects executed by government, and such debarments should be communicated to other sectors to ensure effective implementation.	Reduce contractors motivation to engage in corrupt activities

All stakeholders, including contractors, suppliers, professionals, civil servants, politicians, donor agencies and the private sector in general should act in a more professional manner and not attempt to circumvent the procurement act or other documents, meant to control the sector in order to influence the judgment or actions of officials by inducements of any sort, nor should they engage in unfair or unethical practices that will affect the sector. Because cost escalation can change the fortunes of a project, governments should encourage more awareness campaigns and ensure community participation in all aspect of road policies and implementation.

The management of cost escalation in road sector projects would require that proper scope planning, feasibilities and project planning and risk management planning and assessment are undertaken. This is required to be executed by the implementing agency based on the laid down procurement rules. The application of the procurement rules would need a strict adherence to the laws. Proper scope definition and design management would prevent the issue scope creep and its attendant cost overruns. The improvement of project cash flow goes a long way to improve the project schedule delivery and hence reduce project cost escalations.

On the factors that affect cost escalations, the studies suggest that fluctuation cost in the sector's activities accounts for the high cost escalation, followed closely by exchange rate interference and corruptions shown in table 1. Based on the schedule in table 2, it can be concluded that government involvement, either political or by providing public services, may greatly influenced the level of cost escalation in the sector. However, considering the nature of investment in the sector, the government will continue to play a vital role, particularly in financing and regulating the sector.

The overall conclusion of the study is that several factors contribute to the issue of cost escalation. From the discussion, it is apparent that fluctuation in cost indices, variation, unstable exchange rate regimes, continuous government involvement in the sector, combined with lack of transparency, adequate supervision as well as prompt actions on the part of executing agencies and political influence, accounts for the highest probable cost escalation factors. Appropriately, it would take an integrated and coordinated stakeholder effort to reduce the trend of cost escalation on road projects.

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