An Investigation into the Causes of Delay and Cost Overrun in Uganda's Public Sector Construction Projects

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ABSTRACT

There is great concern for delays and cost overruns as most of the public construction projects are implemented using tax payers' money. At the national and international levels, there is a lot of debate on how to minimise project delays and cost overruns. The main objective of this study was to investigate the causes of construction project delays and cost overruns in Uganda's public sector. Specifically, the study was intended to identify the causes and rank them according to their frequency, severity and importance. The Civil Aviation Authority (CAA) was taken as a case study as a means of validating the results from the survey. Frequency index, severity index and importance index were computed and the factors were ranked for all the twenty factors. The five most important causes of delays in construction projects were found to be; change of work scope; delayed payments; poor monitoring and control; high cost of capital; political instability/insecurity. The relationship between the factors that cause delays and those that cause cost overrun was found to be moderate. Recommendations were made for improved project management; change from the traditional contract type to the design-build type; and improved cash flow on the part of the client so as to reduce payment delays. The results of this research should help construction practitioners, policy makers and researchers in the field of construction management in managing overruns.

Keywords: Construction, cost overrun, public projects, time overrun

1.0 INTRODUCTION

The inability to complete projects on time and within budget continues to be a chronic problem worldwide and is worsening (Ahmed et al., 2002). Azhar and Farouqui (2008) observe that the trend of cost overrun is common worldwide and that it is more severe in developing countries. The debate in the construction industry on how to minimise or eliminate delays and cost overruns has been on for some time among professionals, clients and/or end users, and the policy makers. The funding for construction industry activities is, in many countries, used to regulate the economy. As the construction industry continues to grow in size, so do planning and budgeting problems. This is because it is common for projects not to be completed on time and within the initial project budget. There are quite a number of examples at the national and internal scene. For instance, most of the construction projects in Uganda have had problems with delay in completion and cost overruns and this has caused a lot of concern. A local example is the Northern by-pass in Kampala which was to take two and a half years instead took more than 5 years and the cost had similarly gone up by more than 100 percent (Ssepuuya, 2008). Because of construction delays and cost overruns, less and less work is performed despite the increase in construction budgets. The aim of the research was to investigate the causes of delays and cost overruns on construction projects in Uganda's public sector. Specifically, the research aimed at identifying and ranking the causes of delays and cost overruns on construction projects in

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Uganda's public sector. It is hoped that the findings from this research will be used by project managers, consultants, contractors and students of engineering and construction management.

2.0 REVIEW OF LITERATURE

According to Abbas (2006), late completion of works as compared to the planned schedule or contract schedule is what is known as delay. Delay occurs when the progress of a contract falls behind its scheduled program. It may be caused by any party to the contract and may be a direct result of one or more circumstances. A contract delay has adverse effects on both the owner and contractor (either in the form of lost revenues or extra expenses) and it often raises the contentious issue of delay responsibility, which may result in conflicts that frequently reach the courts. A cost overrun occurs when the final cost of the project exceeds the original estimates (Azhar & Farouqi, 2008).

There is a relationship between schedule, the scope of work and project conditions. Changes to any one or more of the these three can affect the compensation level and time of completion. It has been argued that it is necessary to create awareness of causes of project schedule delays, their frequency, and the extent to which they adversely affect project delivery (Al-Khalil & Al-Gafly, 1999). Kaliba *et al.* (2009) concluded from their study that the major causes of delay in road construction projects in Zambia were delayed payments, financial deficiencies on the part of the client or contractor, contract modification, economic problems, material procurement, changes in design drawings, staffing problems, equipment unavailability, poor supervision, construction mistakes, poor coordination on site, changes in specifications, labour disputes, and strikes.

Agaba (2009) attributes delays in construction projects to poor designs and specifications, and problems associated with management and supervision. In their study, El-Razek et al., (2008) found that delayed payments, coordination difficulty, and poor communication were important causes of delay in Egypt. Sambasivan and Soon (2007) established poor planning, poor site management, inadequate supervisory skills of the contractor, delayed payments, material shortage, labor supply, equipment availability and failure, poor communication and rework, were the most important causes of delays in the Malaysian Construction Industry. Kouskili and Kartan (2004) identified the main factors affecting cost and time overrun as inadequate/inefficient equipment, tools and plant, unreliable sources of materials on the local market, and site accidents. Le-Hoai et al., (2008) ranked the three top causes of cost overruns in Vietnam as material cost increase due to inflation, inaccurate quantity take - off, and labour cost increase due to environment restriction. Kaliba, et al (2009) conclude that cost escalation of construction projects in Zambia are caused by factors such as inclement weather, scope changes, environment protection and mitigation costs, schedule delay, strikes, technical challenges and inflation. Bubshait and Al-Juwait (2002) list the following as factors that cause cost overrun on construction projects in Saudi Arabia: effects of weather, number of projects going on at the same time, social and cultural impacts, project location, lack of productivity standards in Saudi Arabia, level of competitors, supplier manipulation, economic stability, inadequate production of raw materials by the country, absence of construction cost data. It can therefore be deduced that the most important factors vary from one region to another.

3.0 METHODS

Delay and cost overruns were compiled basing on the literature reviewed. Discussions were then held with contractors, government ministry officials, consultants working on public projects, and on personal experience with public construction projects. The delays and cost overruns considered in this study were those that occur during the implementation (construction) phase of construction projects.

The data were acquired using a questionnaire survey and a case study of CAA was used to validate the findings from the survey. Both the survey and case study in this research were mainly quantitative. The questionnaire was complied basing on the compiled list of causes after a pilot study. The piloting was to improve the wording and increase the reliability of the questions. The questions were of closed ended type. The respondents were requested to give their opinion on the frequency and severity of each of the twenty two (22) factors using a 4 - point Likert scale instead of the standard five point scale. The neutral point (where the respondents declare no opinion on the matter) was eliminated from the five-point scales so as to obtain the respondent's views on the subject (Amin, 2005). This is because the respondents who were chosen were assumed to be knowledgeable on the subject. The survey was carried out among corporate members of Uganda Society of Architects (USA), corporate members of Uganda Institution of Professional Engineers (UIPE) and registered Quantity Surveyors who have participated in the implementation phase of construction projects in Uganda's public sector.

4.1 Reliability of the Questionnaire

The reliability analysis of the questionnaire was tested so as to find out whether it was capable of yielding similar score if the respondent used it twice. The Cronbach's alpha was used to measure the reliability of the questionnaire. For ease of work, the SPSS 10.0 was used to compute the alpha for all the four sets of variables. The entire set of variables (88 items) in the questionnaire was also tested. A summary of the tests is given in Table 1 below.

Table 1: Results of Reliability Analysis

Variables	Alpha	Standardised item
		alpha
Frequency of occurrence of factor in causing delays	0.8679	0.8633
Frequency of occurrence of factor in causing cost overruns	0.8539	0.8543
Impact of factors on project time	0.8390	0.8374
Impact of factors on project costs	0.8439	0.8466

According to Reynold and Santos (1999), alpha greater than 0.7 implies the instrument is acceptable. Therefore according to the above results, the instrument was found to be reliable.

4.0 RESULTS AND DISCUSSION

4.1 Survey Response

The frequency, impact and importance of the various factors on cost and time overruns were calculated using the equations adapted from Al-Khalil and Al Ghafly (1999).

F.I =
$$\sum_{0}^{3} (a_i f_i / N)$$
 (1)
S.I = $\sum_{0}^{3} (a_i s_i / N)$ (2)

$$IMP.I = F.I X S.I. / 9 (\%)$$
 (3)

Where a = constant expressing the weight assigned to each responses (ranges from 0 for Never to 3 for Always); $f_i = \text{frequency}$ of each response; $s_i = \text{frequency}$ of each response on impact; and N = total number of responses. The rationale for the importance index is that the importance of

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delay or cost overrun cause is a result of the combined effect of frequency and severity of the factor. Thus two delay or cost overrun factors of the same frequency of occurrence would have the same importance if their score on the severity of impact is equivalent. However, if one of the causes had a more severe impact, then it would be considered more important.

Table 2 gives the five most frequent causes of delay as delayed payment, inadequate/inefficient equipment, re-work due to poor quality work, bureaucracy, and change of work scope. The five most frequent causes of cost overruns were identified as changes in work scope (SN7), inflation and high interest rates, poor monitoring and control, delayed payment to the contractors, and fuel shortage. The five factors ranked highest on impact of delays are delayed payment to contractors, political insecurity/instability, inadequate/inefficient equipment, changes in work scope, and disputes within the parties involved in the project.

The five factors ranked highest on impact on cost overrun are changes in work scope, inflation and high interest rates, fuel shortage, poor monitoring and control, and delayed payment to the contractors. The five factors ranked highest on importance of delays are change of work scope, delayed payment to contractor, poor monitoring and control, inflation and high interest rates and political insecurity/instability. The five factors ranked highest on importance on cost overrun are change of work scope, inflation and high interest rate, poor monitoring and control, delayed payment and deficiency in contract documents.

There are four factors that are ranked highly as very important in terms of having effect on delays and cost overrun. These are changes in scope, delayed payment to contractor, poor monitoring and control and high inflation and interest rates. This is in agreement with the findings made by Azhar and Farouqui (2008) and Sweiss, *et al.* (2008) on cost overrun factors in Pakistan and Jordan respectively.

Changes in scope of work appeared on top of both lists of delay causers. Therefore, there is need to keep scope changes to a minimum. This finding is in agreement with PPDA (2009) in which it was reported that the audited projects experienced cost overruns due to change in work scope. Change in scope may be due to execution of incomplete designs which leads to variations (Alinaitwe, 2008). The other causes of change of scope are due to clients that may not be informed and, therefore, delay in taking decisions on the designs.

The other factor of great importance is delayed payment to contractors. Delayed payment to contractors has knock on effects on many activities of the contractors, subcontractors and suppliers. Contractors tend to transfer the burden of accumulated interest to the client, hence causing cost overrun. Delay of payments is usually caused by bureaucracy in the public sector and lack of proper documentation, and at times deficiency in transparency.

Inflation usually leads to the escalation of prices of materials, equipment and other inputs to the projects. Because the project parties have no control over this factor, they can only minimise delays in the project so that cost overruns due to this factor are minimised (since inflation is a time bound factor).

Poor monitoring and control was ranked as the third among the most frequent causes of cost overruns. This factor causes poor workmanship and schedule creep, which in turn lead to cost overruns.

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Importance In delays In cost overrun	rerrun	Ranking	91	2	8	22	17	4	14	1	11	13	ŝ	9	12		7 V	6	18	7	21	10	19	15	2
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	ys	Ranking	σ		6	21	16	13	11	1	10	14	3	13	12		4 Γ	5	18	8	22	15	20	17	
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		Factors	Inadequate/inefficient equipment, tools and plant	Unreliable sources of materials on the local market		Strikes by site personnel	Inadequate manpower e.g. in terms of numbers, poor /lack of training etc	Delayed payment to contractor/ subcontractor and /or suppliers	Rework due to poor work /wrong materials by the contractor	Change of work scope/ frequent change of work scope / change in material specifications	Poor communication e.g. slow response to site queries, late receipt of drawings etc	Poor schedule management	Poor monitoring and control e.g. due to incompetent/unreliable supervisors	Discrepancy/ deficiency in contract documents	Disputes within the parties involved in the project i.e. client, contractor, consultants	Inflation, high insurance and high interest rates	Fuel shortage	Political insecurity/ instability	Bad weather	Differing site conditions	Site accidents	Large and complex project	Project location e.g. remoteness from business centers, remoteness from the client's base, remoteness from the contractor's base etc	Bureaucracy e.g. PPDA rules regarding approval of changes,	A 4
		SN	-	-	2	3	4	s	9	7	8	6	10	Π	12	;	14	15	16	17	18	19	20	21	1

Table 2: Factors Affecting Cost and Time Overnun

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4.2 Civil Aviation Authority (CAA) Case Study

A total of 30 projects were reviewed. Fifty three percent of the projects in the period of analysis had cost overruns and 40 percent had no change in contract cost. There was cost saving in 7 percent of the projects as projects were completed at costs below the initial contract cost. Eighty four percent of the cost overruns were caused by change in work scope. The remainder of the cost overruns were mainly attributed to inflation. In the CAA projects, the most frequent cause of delays was change in work scope to which 46 percent of the delay causes were attributed. This was followed by delayed payments to which 21 percent of the delay causes were attributed. Fifteen percent of the delays were due to remote location of the projects. Poor communication appeared as the fourth factor to which 6 percent of the delays were attributed. Bad weather, land disputes, rework, and disputes between the project parties were the least common at 3% each.

All the initial project durations for all the projects were taken to be one (01) equivalent project day. The difference between the initial project duration and the final project duration were then taken as a fraction of one equivalent project day. Likewise, the initial project cost for any one projects reviewed was taken to be one (01) equivalent million shillings. The difference between the initial contract sum and the final sum (in millions of Uganda shillings) was taken as a fraction of the equivalent contract sum. These fractions were added and an average taken. An average of 0.465 days per day of the initial contract with a standard deviation of 0.662 was obtained. This implies that on average for every day of the construction projects at the CAA, one should expect a delay of 0.465 days. For example if the initial project duration is 60 days, then the delay on such a project is likely to be $60 \times 0.465 = 27.9$ days by the end of the project. In terms of cost performance, the average cost overrun rate was found to be 0.162 million Ushs per million in original contract sum with a standard deviation of 0.297. For example, if the original contract sum of a project is Ushs 300 (in millions), then one should expect a cost overrun of Ushs 0.162 x 300 = 48.6 million by the end of the project.

5.0 CONCLUSION AND RECOMMENDATIONS

The study investigated the causes of delays and cost overruns in construction projects in Uganda's public sector. The five most important causes of delays and cost overrun are changes in 310

scope, delayed payment to contractor, poor monitoring and control and high inflation and interest rates. These results were also validated by the cases from CAA which indeed showed that these are the most important factors. Stakeholders in the construction industry are advised to minimise change in scope of work as it has the most effect on cost and time overrun. It is recommended that there should be improvement in project management; change from the traditional contract type to the design-build type; and improved cash flow on the part of the client so as to reduce payment delays. The results of this research should help construction practitioners, policy makers and researchers in the field of construction management.

6.0 REFERENCES

- Abbas, M.I. (2006) Causes and Effects of Delays in Aceh Construction Industry, Masters Thesis, Universiti Teknology,
- Agaba, E. (2009) Poor Planning Delaying Government Projects (Business News Pullout), *The New Vision*, Thursday 16 2 2009, Vol. 24, pp 6
- Ahmed S, Azher S, Castillo M, Kappagantula P. (2002) Construction delays in Florida; an empirical study, Florida.
- Alinaitwe, H. M. (2008). Improvement of labor performance and productivity in Uganda's building Industry. PhD Thesis, Lund University, Sweden
- Al-Khalil and Al- Ghafly, M.A. (1999). Important causes of delay in public utility projects in Saudi Arabia, *International Journal of Project Management* Vol 17, Issue 2, pp 647-655
- Amin, M. E. (2005). Social Science Research: Conception, Methodology and Analysis, Makerere University Printers, Kampala, pp 256-257
- 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.
- Bubshait, A.A. & Al-Juwait, Y.A. (2002). Factors contributing to construction costs in Saudi Arabia, *Cost Engineering*, Vol. 44, Issue 5, pp 30.
- El-Razek, M.E.A. Bassoioni, H.A & Mobarak, A.M. (2008). Causes of Delay in building Construction Projects in Egypt, *Journal of Construction Engineering and Management*, Vol 134, Issue 11, p 831
- Kaliba, C, Muya, M & Mumba, K. (2009). Cost Escalation and Schedule Delay in Road Construction Projects in Zambia, *International Journal of Project Management*, Vol27, Issue 5, pp 522-531.
- Kousliki, P. A., & Kartan, N. (2004). Impact of construction materials on project time and cost in Kuwait. Journal of Construction and Architectural management, Vol. 11, Issue 2, pp 126 -132
- Le-Hoai, L., Lee, Y.D. & Lee, J.Y. (2008), Delay and Cost Overrun in Vietnam Large Construction Projects: A comparison with other selected Countries, *KSCE Journal of Civil Engineering*, Vol 12, Issue 6, pp 367-377.
- PPDA, (2009), Contract Audit Report on the construction of sampled seed secondary schools by MOES
- Sambasivan, M. & Soon, Y.W. (2007), Causes and Effects of Delays in Malaysian Construction Industry, *International Journal of Project management*, Vol. 25, Issue 5, pp 517-526
- The Public Procurement and Disposal of Public Assets (PPDA) Act, N0 40 (1)
- Uganda Bureau of Statistics (2009) Statistical Abstract. Government of Uganda Printery, Entebbe.

Issues Confronting Women Participation in the Construction Industry

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ABSTRACT

This paper raises the issues confronting the minority cohort's participation in the construction industry. Women in construction are seen as the wrong gender to be around for the construction occupations require not only manual dexterity but physical strength. Currently, the industry is employing less than 10% of the female in the workforce with even lower participation in crafts and trade. This paper discussed about the current women participation in construction focusing on the European Union (EU) 27 member countries. Additionally, issues and barriers preventing women entering and retaining in the industry was also debated. A strong finding from the paper is that it is not the technical skills that need proving but rather comprising their identity as women to meet the demands of the workplace and having the ability to fit into the accepted behaviour of the workplace. There is also concern among the women workers of having to balance between successful career and family lives. Lastly, the paper highlights suggestions to create a better path for women's participation and retention in this male-dominated zone. Among them are bringing more female role models at the lower education level to aspire career in construction, clearer equal opportunities at the workplace and stronger roles of the social partners.

Keywords: construction, participation trend, recruitment and retention, women

1.0 INTRODUCTION

Until today the construction industry with its extreme gender stratification is still conservative in its recruitment of women. The prevalent social conditions underpins the occupational segregation of the labour market into masculine and feminine jobs is as imperforate today as it was at the beginning of the century, with construction as the prime example. The majority of women working in the construction industry undertake administrative, technical and professional work while the intake at the operative level is very low and the data are scarce to non-existence, but in most countries these represent less than 1% of the workforce (Clarke et al 2005). Inevitably it can be concluded that construction is not only male-dominated but is devoid of female participation.

There are many studies discussing the reasons why female workers shy away from the construction industry as a whole and the craft sector in particular (Wangle, 2009; Chandra and Loosemore, 2004; Agapiou, 2002; Whittock, 2002; Fielden *et. al*, 2000). Among the common barriers are social acceptance of employment, sexually-inappropriate occupation, sexual discrimination, sexual harassment, physical incapability, unqualified for blue-collar jobs and labour conditions such as extreme weather, unsociable work-hours and exposure to hazards. Contrary, there have been few studies focusing on factors influencing women entry into construction and what their expectations are (Bennett *et al*, 1999; Clarke *et. al.* 1999). One study showed that many students choose the path without full knowledge about the industry and its culture. Evidently, career choices of young people are influenced by many factors from events in early childhood to parents, peers and career advisers. A few had friends that