

# Major causes of construction time and cost overruns

## A case of selected educational sector projects in Ghana

Samuel Famiyeh, Charles Teye Amoatey and Ebenezer Adaku  
*Business School, Ghana Institute of Management and Public Administration,  
Accra, Ghana, and*

Collins Sena Agbenohevi  
*Procurement and Project Management Consultancy Limited, Accra, Ghana*

Construction  
time and cost  
overruns

181

Received 28 November 2015  
Revised 23 February 2016  
Accepted 4 April 2016

### Abstract

**Purpose** – In Ghana, the duration of construction projects from inception to completion is becoming a great concern, recently, especially among clients and beneficiaries, because of the rising interest rates, inflation, development plan targets, among other factors. Hence the need to understand the causes of delays and cost overrun in the construction sector has become more important than ever. This study therefore aims to identify the major factors underlying time and cost overruns in projects related to the education sector in Ghana to proffer practical solutions in addressing them.

**Design/methodology/approach** – The study conducted a survey among clients' consultants and representatives of the contractors working on about 60 government school projects. A relative importance index was used to determine the relative effects of the factors causing construction time and cost overruns.

**Findings** – The key factors causing construction time overrun were: financial problems, unrealistic contract durations imposed by clients, poorly defined project scope, client-initiated variations, under-estimation of project cost by consultants, poor inspection/supervision of projects by consultants. Other factors were underestimation of project complexity by contractors, poor site management, inappropriate construction methods used by contractors and delays in the issuance of permits by government agencies. Factors affecting cost overruns were financial difficulty by client, delays in payments of completed works, variations in designs, lack of communications plans, poor feasibility and project analysis, poor financial management on site and material price fluctuations.

**Research limitations/implications** – The research was limited to only the educational sector projects.

**Practical implications** – Practically, this study highlights for the construction sector the critical factors causing project time and cost overruns in Ghana. Identification of these factors provides the basis for pragmatic solutions to enhance the chances of project success.

**Social implications** – The identification and solutions to project time and cost overruns, especially for educational sector projects, contribute toward making public goods more affordable and accessible to most citizens, particularly in developing countries.

**Originality/value** – This study contributes to the debate on factors causing project time and cost overruns in the construction sector especially from a developing country's perspective.

**Keywords** Construction, Ghana, Project, Time, Cost

**Paper type** Research paper



### Introduction

The increasing complexity of infrastructure projects and the environment within which they are delivered place greater pressure on construction managers to deliver projects on time, within budget and of higher quality (Enshassi *et al.*, 2003, 2008). To the dislike of project

stakeholders, many projects experience extensive time and costs overruns (Enshassi *et al.*, 2009). In practice, time and cost overruns occur in most construction projects, and the magnitude of these overruns varies significantly from project to project and country to country (Wa'el *et al.*, 2007). In total, 47 “megaprojects” in the construction industry were studied by Merrow *et al.* (1988). They found that only four were on budget with an average cost overrun of 88 per cent. Also, according to Flyvbjerg *et al.* (2003), cost overruns are especially evident in infrastructure projects.

The construction sector plays a critical role in every country's economy. The construction industry's share in Ghana's overall gross domestic product grew from 7.6 per cent in 1996 to 9.9 per cent in 2011 and rose further to 12.6 per cent in 2013 (Ghana Statistical Service, 2013). Also, the construction sector's contribution to the overall industrial development grew from 29.8 per cent in 1993 to 34.3 per cent in 2000.

The nature and causes of time overruns and their impact on project costs also vary between developing and developed countries (Shebob *et al.*, 2012). Keeping construction projects within estimated costs and schedules requires sound strategies, good practices and careful judgment. Studies by Odeyinka and Yusuf (1997), Frimpongs *et al.* (2003), Berko (2007), Agyakwa-Baah (2007, 2009), Amoatey *et al.* (2015) have, to some extent, examined project time and cost overruns within the construction industry in the African context. Amoatey *et al.* (2015) identified factors that contribute to project time overruns in Ghana as delays in payment to contractors/suppliers, inadequate funds from sponsors/clients, variation orders and poor financial/capital market. The effects of these time overruns are cost overruns, litigation, pre-mature termination of projects by clients and arbitration actions. In Ghana, variation in duration of construction projects from inception to completion is assuming great importance recently, especially among clients and other stakeholders because of rising interest rates, inflation and other commercial pressures, development plan targets, among other factors. Alkass and Harris (1991) indicated that time overrun is the commonest challenge in managing projects and that analysing construction time overrun has become a critical issue in project management recently. Even with today's advances in technology and project management techniques, construction projects continue to suffer time overruns.

Time and cost overruns in the construction of schools in Ghana are currently becoming a chronic problem that all stakeholders in the educational sector are facing. Some educational projects, which were awarded in 2010, with initial contract durations of six months are still at various levels of completion. While the Ghanaian construction sector continues to grow, like most of the countries in the sub-Saharan region, project time overrun contributing to the cost overrun has recently become pervasive in public sector projects (Muhwezi *et al.*, 2014). Most projects in the educational sector have time overruns for years and their costs have escalated in folds. Aibinu and Jagboro (2002) investigated the effects of time overruns in project delivery in the Nigerian construction industry and sought ways to minimize the effect of time overruns. They concluded that project time overruns could lead to cost overruns. The claims and fluctuations due to project time overruns have had a significant effect on the final project costs. Nguyen *et al.* (1996) established that there are distinctive problems that cause delays in construction. These were classified into three groups: problems of shortage or inadequacies in industry infrastructure (mainly supply of resources), problems caused by clients and consultants and problems caused by contractor incompetence/inadequacies. Despite previous studies conducted on causes of construction projects time and cost overruns, more projects in the public sector continue to slip in time with its attendance cost consequences, especially in Ghana. This study, therefore, provides the basis for further

investigations into the major factors underlying time and cost overruns of building projects for educational purposes in Ghana to proffer solutions to them.

A systematic analysis of Ghana's educational system shows that poor and inadequate school infrastructure is a major constrain to enhanced school achievement. The government's goal to improve the infrastructure situation in public schools is often hindered by delays and the associated additional costs of delivering these projects. An audit of 60 Ghana Education Trust Fund (GETFUND) school infrastructure projects implemented between 2005 and 2010 showed that inadequate planning and lack of due diligence resulted in price fluctuation and cost overruns of 49 per cent. Again, a review of 65 projects in ten educational institutions in Ghana showed that only five projects were completed within the scheduled date, 13 exceeded their stipulated dates within two years and 47 were completed beyond two years (Government of Ghana, 2013). School infrastructure project delays can have very dire consequences in the long term. Previous school project delays resulted in crippling some students' academic aspirations and, on a larger scale, shifts in the academic curricular as experienced in the transition from three years to four year of senior high school (SHS) curriculum.

This study therefore seeks to identify the major factors causing time and cost overruns in projects related to the educational sector buildings in Ghana. The main objective of this study is to identify the major causes of the project time and cost overruns in government-sponsored educational projects in Ghana.

The rest of the paper presents the literature review focusing on the factors causing project time and cost overruns. Second, the study methodology and conceptual model are presented. The fourth and fifth sections present the results, analysis, conclusions and managerial recommendations, respectively. In the last section, we present the limitations of the study and point out areas for further research.

#### *Literature review*

Project time overrun is defined as the extension of a project time beyond the planned completion date (Kaming *et al.*, 1997; Annan, 2003). Besides, a project cost overrun may be generally expressed as a per cent difference between the final cost of the project and the original contract sum. A negative value indicates a project cost saving, while a positive value indicates a cost overrun. (Bordat *et al.*, 2004). According to Choudhury and Phatak (2004), time in construction projects can be regarded as the elapsed period from the inception of a construction project to the completion and handover of the project to the client. Project schedule management is a critical aspect of project management because of its consequence for development targets and costs.

Some major causes of time overruns as identified from the literature include actions and inactions of project participants (Aibinu and Odeyinka, 2006). A field survey conducted in Saudi Arabia revealed 73 causes of time overruns broadly ascribed to owners, consultants and contractors as labour shortage, delay in interim payment, awarding contracts to the lowest bidder, incompetent human resources, delays in checking and approving the design documents, among others. (Assaf and AL-Hejji, 2006). Al-Moumani (2000) investigated time overrun causes in 130 public projects made of residential, office and administration buildings, school buildings, medical centres and communication facilities in Jordan and found that the main causes of time overruns were related to poor designs, user changes, weather, site conditions, late deliveries and economic conditions. A further study by Odeh and Battaineh (2001), in Jordan, indicates that among the most important causes of time overruns in construction projects under traditional type of contracts, from the perspective of contractors and consultants, are: owner interference, inadequate contractor experience,

delayed financing and payments, low labour productivity, slow decision-making, improper planning and problems with subcontractors. Subsequently, [Sambasivan and Soon \(2007\)](#) also conducted a study on the Malaysian construction industry to determine major factors that lead to project time overruns and their impact on project completion. Their study identified ten most importance causes of time overruns out of 28 causes as: contractor's improper planning, contractor's poor site management, inadequate contractor experience, client's inadequate financial resources and payments for completed work, problems with subcontractors, shortage in material, inadequate labour supply, equipment unavailability and failure, lack of communication between parties and mistakes during the construction stage. [Kaliba et al. \(2009\)](#) also identified that major causes of time overruns in construction projects in road construction projects in Zambia were delayed payments, financial deficiencies on the part of the client or the contractor, contract modifications, economic problems, material procurement problems, changes in design drawings, staffing problems, unavailability of equipment, poor supervision, construction mistakes, poor coordination on site, changes in specifications, labour disputes and strikes. In Ghana, [Fugar and Agyakwah-Baah \(2010\)](#) concluded that the nine major factors that cause time overruns in construction projects are: inadequate financial resources, materials shortage on site, poor scheduling and controlling, poor contractual relationship, changes in designs, equipment unavailability, environmental issues, government and labour challenges.

Generally, in the management of construction projects, when time overruns, it potentially engenders cost overruns. However, the cost of construction projects can equally overrun not necessarily from time overruns but from poor project cost estimation and uncertain environmental factors during the implementation of the project. A study conducted on 31 construction projects in Indonesia that surveyed contractors indicates that cost overruns were mainly caused by "inaccuracy of material take-off", "increase in material costs" and "cost increase due to environmental restrictions" ([Kaming et al., 1997](#)). Besides, [Jackson \(1999\)](#) conducted a study in the UK on building construction projects and found that poor project management, unexpected ground conditions, design development challenges, information unavailability, design brief flaws, improper estimating method, poor design team performance, time limit, claims, commercial pressure, procurement route, external factors and people were the causes of cost overruns. A study by [Okpala and Aniekwu \(1988\)](#) found that there seems to be an agreement between architects, consultants and clients that shortage of materials, inadequate finance and delayed payment of completed works and poor contract management were the most important causes of cost overruns. [Ayman and Al-Momani \(2000\)](#) studied the performance of transportation infrastructure projects in Nigeria and concluded that material price fluctuations, inaccurate estimates, project delays and additional work contributed most to cost overruns. Cost of materials, fraudulent practices and fluctuations in materials prices were some of the causes of time and cost overruns in the construction projects in Nigeria ([Elinwa and Buba, 1993](#)). [Frimpongs et al. \(2003\)](#), while studying the causes of time and cost overruns in groundwater projects in Ghana, indicated that "late monthly payments from clients" was the most important cause of time overruns and hence cost overruns as identified by contractors, while clients ranked "poor contractor performance" as the most important cause of time and cost overruns. An empirical study conducted on Zambia Road construction projects revealed that bad weather, inflation, schedule delay, scope changes, local government pressures, strikes, technical challenges and environmental protection and mitigation were some of the major causes of cost overruns ([Kaliba et al., 2009](#)). Incidentally, it appears that a number of studies ([Okpala et al., 1988](#); [Frimpongs et al., 2003](#); [Alaghbari et al., 2007](#); [Fugar et al., 2010](#)) emphasise inadequate finance and delays in interim payments of works done as the major causes of

project time and eventual cost overruns. Ogunlana *et al.* (1996) argue that poor contract management causes project time and cost overruns. In addition, other scholars (Mansfield *et al.*, 1994; Al-Moumani, 2000) posit that changes in site conditions lead to time and cost overruns for projects. While uncertainties in weather conditions may underlie project time and cost overruns (Mansfield *et al.*, 1994; Kaming *et al.*, 1997; Bubshait and Al-Juwait, 2002; Chimwaso, 2001), poor site and materials management frequently leads to materials' shortage on site and impacts negatively on project schedules and cost.

A review of public sector construction projects in Nigeria by Dlakwa and Culpin (1990) indicated that the three major causes of cost overruns are "fluctuations in material prices", "labour and plant costs", "construction delays" and "inadequate pre-planning". Construction projects are recently growing in complexities. Hence, contractors' experience, both in project complexities and geographically, is contributing to projects success, recently. This corroborates Kaming *et al.*'s (1997) assertion that contractors' lack of both project type and geographical experiences could potentially engender project time and cost overruns. Bubshait and Al-Juwait (2002) in a study identified the work load of contractors, social and cultural impacts, project location, lack of productivity standards, supplier manipulation, economic stability, inadequate production of raw materials by the country and absence of construction cost data, in Saudi Arabia, as some of the causes of project time and cost overruns. Le-Hoai *et al.* (2008) ranked the top three causes of cost overruns in Vietnam and pointed to material cost increment due to inflation, inaccurate quantity take-off and labour cost increase due to environmental restrictions. In Zambia, Kaliba *et al.* (2009) indicates that cost overruns of construction projects are fundamentally caused by inclement weather, scope changes, environment protection and mitigation costs, schedule overrun, strikes, technical challenges and inflation.

## Methods

This section expounds the methodology used in the design of questionnaire, sampling procedures used, method of data collection and the analytical procedures adopted for the work. Questionnaires were used because of their convenience, cost and time effectiveness when compared to face-to-face interviews given that the respondents are scattered in various parts of Ghana. The questionnaire was carefully designed to avoid several shortcomings associated with questionnaire surveys, including poor response rates and problems relating to question construction and wording (Lozar Manfreda *et al.*, 2002; Reips, 2000). The questionnaires were designed based on information obtained from the theoretical framework and review of existing literature on the subject. The questions were designed to gather information relevant to the objectives of the study. Ordinal scale adopted by Enshassi *et al.* (2003) was assigned for level of significance instead of using abbreviation, i.e. 0 = not significant; 1 = slightly significant; 2 = moderately significant; 3 = very significant; 4 = extremely significant. The questionnaire consists of three main sections. The first section was intended to gather information about the respondents' profile, the second relates to questions on the major causes of time overruns (delays) and the third section focuses on the major causes of cost overrun on the selected case projects. This was mainly based on a synthesis of potential causes of time and cost overruns identified by previous researches (Odeh and Battaineh, 2002; Koushki *et al.*, 2005; Assaf and AL-Hejji, 2006; Lo *et al.*, 2006; Sweis *et al.*, 2008; Muhwezi *et al.*, 2014) etc. Prior to data collection, a preliminary study was conducted by interviewing three experienced personnel in the construction industry to validate the contents of the questionnaire and confirming the relevancy of the issues to be investigated. The survey was carried out amongst the clients (technical officers and selected municipal/district works engineers); professionals of the quality assurance consultant; and

representatives of the contractors (mostly their site engineers, project managers, etc.) working on these projects. A total of 30 questionnaire sets were distributed to ten officials from the project client's office, ten consultants and ten contractors. Relative importance index (RII) developed by Kometa *et al.* (1994) was used to determine the relative significance and ranking of the causes. This is an accepted technique that has been used by various researchers such as Sambasivan and Soon (2007) and Muhwezi *et al.* (2014) to investigate the causes of delay in construction projects in Kuwait, Malaysia and Uganda. The same technique has also been used by Enshassi *et al.* (2009) and Amoatey *et al.* (2015) in understanding delays and cost overruns in the construction projects in the Gaza Strip and in the Ghanaian state housing construction projects respectively.

## Results

This section outlines the findings and analysis of the results of the survey conducted. The data collected narrowed down the major causes of time and cost overruns in the selected projects. The data gathered from the survey were analysed descriptively and quantitatively to assess the causes of time and cost overruns.

### *Background of respondents*

Out of the 30 questionnaires distributed, 29 respondents returned completed forms, with one of the client's representative giving an excuse of not having internet access to send his completed form. This represented a response rate of 96.7 per cent with details of distribution shown in Table I.

From Table I, it can be observed that very experienced respondents were chosen for the study. They have all worked on more than three construction projects in the past five years.

### *Data analysis*

RII method was used to calculate and rank the factors according to the degree of their significance as indicated by the respondents. In fact, a similar process has been used to assess the major construction risk factors considered by general contractors in Qatar (Jarkas and Haupt, 2015). The aggregate RII for the seven categories, namely, owner's/ client's responsibilities; consultant's responsibilities; contractor's responsibilities; government, material and contractual relationships; and external factors, according to Enshassi *et al.* (2009), were computed. This was used to determine the major causes of both time and cost overruns separately. The RII is computed using the expression below:

Characteristics	Frequency	(%)	Cumulative (%)
<i>Respondents</i>			
Clients	9	31.03	31.03
Consultants	10	34.48	65.52
Contractors	10	34.48	100.00
<i>No. of projects worked on</i>			
1 to 3	3	10.34	10.34
4 to 6	11	37.93	48.28
>7	15	51.72	100.00
<i>Work experience</i>			
<5	0	–	–
5 to 10	19	65.52	65.52
>11	10	34.48	100.00

**Table I.**  
Background and demographic characteristics of respondents

$$RII = \frac{\sum W}{A \times N}$$

Where:

RII = is the relative importance index;

W = is the weight given to each factor by the respondents and ranges from 0 to 4;

A = is the highest weight (i.e. 4 in this case); and

N = is the total number of respondents.

The results were summarised and presented in [Tables II](#) and [III](#) to make the analysis simple. They have been classified into seven categories according to [Enshassi et al. \(2009\)](#).

### Findings

*The effect of client-related factors on project duration.* One of the key objectives of this work was to explore the extent to which the key stakeholders, i.e. the client, consultant and the contractor delay factors, affect the duration of government school projects in Ghana. In addition, the effect of other relevant environmental factors such as government actions, materials, contractual and external factors were also assessed. In this section, the findings showed the extent to which the various factors related to the key stakeholders and other environmental factors affect the duration of these projects. The research establishes that client-related factors had the highest impact with an aggregate RII of 0.69. From [Table II](#), it can be seen that the key factors that normally contribute to most delays in school infrastructure projects in Ghana were financial problems such as delays in payment (RII = 0.83), unrealistic contract durations imposed by owner (RII = 0.79), poorly defined scope (RII = 0.75) and owner-initiated variations/interference (RII = 0.71). In addition, variations in design changes and poor communications both registered an RII of 0.68. Finally, poor feasibility and project analysis registered an RII of 0.65. In this research, any factor that registered an RII of <0.599 was considered insignificant as suggested by [Muhwezi et al. \(2014\)](#).

*The effect of consultant-related factors on project duration.* The research also sought to understand how consultant-related factors can also affect the duration of the projects in Ghana. Here, the study revealed that consultant-related factors also seem to have high impacts on projects in Ghana ranking third with an aggregate RII of 0.62. From [Table III](#), it can be seen that the key factors that normally contribute to most of those delays were, delays in payments (RII = 0.83), underestimation of project cost (RII = 0.82), poor inspections and supervisions on the part of the consultant (RII = 0.80), poor contract management (RII = 0.79) and instructions delays (RII = 0.76). The others were poorly defined scope of work (RII = 0.75), design variations and poor communications, all registering an RII of 0.68.

*The effect of contractor-related factors on project duration.* In addition, the research sought to understand the factors that are related to contractor's delays on projects in Ghana. The results indicate high delay impacts related to actions from contractors with an aggregate RII of 0.64, ranking second on the list of the broad issues identified. From [Table II](#), it can be seen that the key factors that normally contribute to most of those delays were underestimation of project complexity on the part of the contractor (RII = 0.81), difficulty in accessing credit (RII = 0.80), poor site management (RII = 0.77), construction methods used (RII = 0.77), shortage of equipment and tools on site (RII = 0.74), poor communication and misunderstanding (RII = 0.68) and insufficient number of staff (RII = 0.65). [Manavazhia and Adhikarib \(2002\)](#) also identified delay in the delivery of materials and equipment to

JEDT 15,2	S/No.	Client-related delay factors	RII	Rank	
<b>188</b>	1	Financial problems (delayed payments/financial difficulties and economic problems)	0.83	1	
	2	Unrealistic contract durations imposed by owner	0.79	2	
	3	Poorly defined scope	0.75	3	
	4	Owner-initiated variations	0.71	4	
	5	Owner interference	0.71	4	
	6	Variations (design changes/ extra work)	0.68	6	
	7	Poor communications	0.68	6	
	8	Poor feasibility and project analysis	0.65	8	
	9	Slow decision-making by owners	0.43	9	
	10	<i>AGGREGATE RII</i>		0.69	
			Consultant-related delay factors		
	1	Delays in payments	0.83	1	
	2	Under estimation of project cost	0.82	2	
3	Poor inspection/supervision	0.80	3		
4	Poor Contract management.	0.79	4		
5	Slowness in giving instructions	0.76	5		
6	Poorly defined scope	0.75	6		
7	Variations (design changes/ extra work)	0.68	7		
8	Poor communications	0.68	7		
9	Poor feasibility and project analysis	0.65	9		
10	Delay in Preparation and approval of drawings	0.49	10		
11	Quality assurance/control.	0.47	11		
12	Waiting time for approval of tests and inspections	0.39	12		
13	Absence of consultant's site staff	0.37	13		
14	Lack of experience on the part of the consultant	0.33	14		
15	<i>AGGREGATE RII</i>		0.62		
		Contractor-related delay factors			
1	Underestimation of project complexity	0.81	1		
2	Financial problems (difficulty in accessing credit)	0.80	2		
3	Poor site management	0.77	3		
4	Construction methods	0.77	3		
5	Poor preparation and planning (material/labour estimation)	0.75	5		
6	Equipment and tool shortage on site	0.74	6		
7	Poor communications and misunderstanding	0.68	7		
8	Insufficient number of staffs	0.65	8		
9	Subcontractors (lack of experience, etc.)	0.50	9		
10	Inadequate contractor experience	0.45	10		
11	Mistakes during construction.	0.42	11		
12	Poor financial management	0.40	12		
13	<i>AGGREGATE RII</i>		0.64		
		Government actions related delay factors			
1	Slow permits by Govt. agencies	0.70	1		
2	Ineffective legislative instrument	0.53	2		
3	Bureaucracy in Government agencies	0.53	2		
4	Political interference	0.48	4		
5	Building Regulations	0.42	5		
6	<i>AGGREGATE RII</i>		0.53		

**Table II.**  
Relative importance  
index and rank of time  
overrun factors

(continued)



Table II.

S/No.	Client-related delay factors	RII	Rank
Material related delay factors			
1	Shortage of materials	0.79	1
2	Escalation of material prices	0.78	2
3	Delay of material delivery to site	0.75	3
4	Poor procurement programming of materials	0.41	4
5	Low quality of materials	0.41	4
6	AGGREGATE RII	0.62	
Contractual-related delay factors			
1	Major disputes and negotiations	0.65	1
2	Poor communication plan	0.62	2
3	Inappropriate type of contract used (Procurement process)	0.47	3
4	Mistakes and discrepancies in contract documents	0.42	4
5	Inappropriate overall organizational structure linking all parties to the project	0.34	5
6	AGGREGATE RII	0.50	
External-related delay factors			
1	Poor site conditions (location, ground, etc.)	0.65	1
2	Bad weather	0.64	2
3	Poor economic conditions (currency, inflation rate, etc.)	0.63	3
4	Transportation delays	0.58	4
5	Changes in laws and regulations	0.33	5
6	Strikes	0.32	6
7	External work due to public agencies	0.28	7
8	Problems with neighbours	0.28	7
9	AGGREGATE RII	0.46	

construction sites as contributory causes to cost overruns in construction projects in developing countries.

*The effect of government actions on project duration.* Other important factors that were important in the study were the factors related to government actions or inactions. The results from the research indicate an average impact related to government actions, ranking fifth with an aggregate RII of 0.53. From Table II, it can be seen that the only one key factor contributing to this effect is the slowness in the issuance of permits on the part of government agencies with an RII of 0.70. The rest of the factors used in the study seem to have no significant impact on the duration of government projects using a threshold value of 0.599.

*The effect of procurement and delivery of materials on project duration.* The prices, procurement and delivery of materials can also be a major factor that can affect the duration of projects and hence these were also examined in this research. From the results, factors related to the procurement and delivery of materials for projects in Ghana also seems to have a high impact, ranking third with an aggregate RII of 0.62. From Table II, there were three key factors contributing to this effect: shortage of materials (RII = 0.79), escalation of material prices (RII = 0.78) and delays in the delivery of materials to site (RII = 0.75).

*The effect of contractual and external factors on project duration.* From the results obtained, contractual and external factors do not seem to have any impact on the duration of projects in Ghana, registering an aggregate RII of 0.50 and 0.46, ranking sixth and seventh, respectively. Although at the aggregate level the RII values were not significant, however,

JEDT 15,2	S/No.	Client-related cost factors	RII	Rank	
<b>190</b>	1	Financial difficulty by client	0.79	1	
	2	Delay in payment of completed works	0.76	2	
	3	Variations	0.74	3	
	4	Project delays	0.73	4	
	5	Delay in contract awards	0.72	5	
	6	Poor communications	0.71	6	
	7	Delay in decision making	0.71	6	
	8	<i>AGGREGATE RII</i>		<i>0.73</i>	
			Consultant related cost factors		
	1	Poor contract management	0.73	1	
	2	Poor feasibility and project analysis	0.72	2	
	3	Poor supervision	0.72	2	
	4	Inaccurate estimates	0.71	4	
	5	Poor project management	0.69	5	
	6	<i>AGGREGATE RII</i>		<i>0.71</i>	
			Contractor-related cost factors		
	1	Poor financial management on site	0.74	1	
	2	Project schedule delays	0.73	2	
	3	Inaccurate estimates (cost and schedule)	0.71	3	
	4	Poor project management	0.69	4	
	5	<i>AGGREGATE RII</i>		<i>0.71</i>	
			Government-related cost factors		
	1	Slow permits by government agencies	0.70	1	
	2	Bureaucracy in government agencies	0.52	2	
	3	Political interference	0.43	3	
	4	<i>AGGREGATE RII</i>		<i>0.55</i>	
		Material-related cost factors			
1	Material price fluctuations	0.83	1		
2	Shortage of materials	0.74	2		
3	<i>AGGREGATE RII</i>		<i>0.78</i>		
		Contractual-related cost factors			
1	Project delays	0.73	1		
2	Environmental protection	0.35	2		
3	<i>AGGREGATE RII</i>		<i>0.54</i>		
		External-related cost factors			
1	Material price changes (inflation)	0.83	1		
2	High cost of labour	0.70	2		
3	Strikes	0.44	3		
4	Bad weather	0.33	4		
5	<i>AGGREGATE RII</i>		<i>0.57</i>		

**Table III.**  
Cost overrun  
factor – subgroups

factors such as major disputes and negotiations and poor communications plan register an RII of 0.65 and 0.62, respectively, under the contractual factors. All the others were not significant. Similarly, four factors registered a somewhat high RII under the external environment, although the aggregate was not significant. They were poor site conditions (RII = 0.65), bad weather (0.64), poor economic conditions (RII = 0.63) and transportation delays (RII = 0.58).

*The effect of client-related factors on project cost.* The second key objective of this research was to explore the extent to which the key stakeholders's, i.e. the client, consultant and the contractor, behavioural factors affect the cost of government school projects in Ghana. In addition, the effect of the other relevant environmental factors such as government actions, materials, contractual and external factors are also assessed. The research further establishes that client-related factors had a high impact on the projects in Ghana, with an aggregate RII of 0.73 and was ranked as the second most frequent cause of delays. From Table III, it can be seen that the key factors that normally contribute to the increase in cost in such projects in Ghana were financial difficulties on part of the client (RII = 0.79), delays in payment of completed tasks (RII = 0.76), variations in design (RII = 0.74), project delays (RII = 0.73) and delays in contract awards (RII = 0.72). Delays in decision-making and poor communications both registered an RII of 0.71. This finding confirms the works of Frimpongs *et al.* (2003) and Amoatey *et al.* (2015), who also identified most of these factors to have a critical impact on Ghana's construction sector.

*The effect of consultant-related factors on project cost.* Five key factors were used to assess the issues related to consultant responsibility. From Table III, it can be seen that the aggregate RII for consultant-related factors was 0.71, scoring third within on the list of key stakeholder groups. The key factors contributing to this aggregate score were poor contract management (RII = 0.73), poor feasibility and project analysis (0.72), poor supervision (RII = 0.72), inaccurate estimation (RII = 0.71) and poor project management (RII = 0.69). These factors are buttressed by the findings of Kometa *et al.* (1994) who indicated almost all these factors as impacting on the construction sector.

*The effect of contractor-related factors on project cost.* The effect of contractor-related responsibilities on project cost was examined using four key factors, namely, inaccurate estimates on cost and schedules, poor project management, schedule delays and poor financial management on site. It can be seen that the aggregate RII on the contractors' factors was 0.71, also ranking third in the factors examined. Factors that were contributing to this change in cost were poor financial management on site (RII = 0.74) (confirmed by Amoatey *et al.* (2015), project schedule delays (RII = 0.73) (buttressed by Al-Khalil and Al-Gafly (1999), inaccurate estimates (RII = 0.71) and poor project management (RII = 0.69).

*The effect of government actions-related factors on project cost.* The behavior of the stakeholder government can really affect the cost of the project, and this was assessed by using three key factors, namely, political interference, bureaucracy in government agencies and slow payment on the part of government. From Table III, the aggregate score on the part of government was 0.55, ranking sixth in the factors examined. The key factor contributing to the change in cost on the part of government was the slowness on its part when it comes to payments, scoring an RII of 0.70. The other two factors, bureaucracy on the part of government agencies (RII = 0.52) and political interference (RII = 0.43), were all insignificant in the Ghanaian context, as they registered an RII of <0.599 as suggested by Muhwezi *et al.* (2014).

*The effect of material prices and availability-related factors on project cost.* The effects of material usage on the cost of projects were also assessed using their prices and availability. From Table III, it can be seen that this factor has the most significant impact on the cost of projects in Ghana, ranking first with an aggregate RII of 0.78. The key factors contributing to this aggregate were fluctuations in material prices (RII = 0.83) and shortage of materials (RII = 0.74). These findings are further buttressed by Assaf *et al.* (1995) and Ambituuni (2011) who found that shortage of materials and fluctuation of prices or rising cost of materials are critical factors affecting construction sector performance.

*The effect of contractual-related factors on project cost.* The effect of contractual-related impacts on project cost was also assessed using two key factors, project delays and environmental protection. From Table III, the aggregate relative importance score for contractual related factors was 0.54, ranking seventh on the issues examined. The key factors contributing to this were project delays (RII = 0.73) and environmental protection (RII = 0.35).

*The effect of external factors on project cost.* The external issues affecting project cost were examined using four key factors, material price fluctuations, high cost of labour, bad weather and strikes. From Table III, the aggregate RII was 0.57, ranking fifth on the issues examined. Factors contributing to this aggregate were material price changes (RII = 0.83) and high labour cost (RII = 0.70). The remaining, strikes (RII = 0.44) and bad weather (RII = 0.33), were insignificant, contributing less to this effect. These external factors are confirmed by Ahmed *et al.* (2002).

### Discussions and conclusions

The key objectives of this research work were to understand the major factors causing project time and cost overruns in the constructions of government school projects. This work identified 34 factors considered as significant factors affecting project time overruns. On the issue of cost, it registers 22 significant factors.

On the clients' side, the results indicate that one of the critical factors causing project time overruns in the construction of schools in Ghana was delays in payments of contractors, reaffirming the results of Frimpongs *et al.* (2003), Assaf and AL-Hajji (2006), Sambasivan and Soon (2007) and Kaliba *et al.* (2009). It is therefore important for both clients and consultants to ensure there is enough cash flow before commencing projects, as this has the potential of delaying project times and cost implications. Another key issue unearthed by this work is the problem of poorly defined scope on the part of the client which in turn causes delays in project duration, reaffirming the works of Dlakwa and Culpin (1990), Jackson (1999). A project with a poorly defined project scope will definitely not have a clearly defined duration and an accurate budget (Dlakwa and Culpin, 1990; Jackson, 1999). It is important for a clearly defined project scope statement to guide the estimation of project times and cost to avoid the issues of project time and cost overruns. To achieve this objective, there is the need for the client, the consultant and the contractor to meet prior to the commencement of the project to clarify the scope of the project to avoid problems with variations and avoidable design changes in the course of the project.

A new insight identified in this work was the imposition of unrealistic contract duration, causing project time delays. Accurate time estimation must be made by qualified consultants who have carried out proper project analysis and feasibility studies on the various project locations to avoid undue pressure to imposed unrealistic duration and pressure on service providers.

For consultants, the results identified the possibility of underestimating project time and cost during the planning phase as one of the factors causing delays in increasing costs of projects, also reaffirming the work by Dlakwa and Culpin (1990). This normally occurs when consultants do not find enough time to have a good work breakdown structure (WBS). When the project WBS is not detailed enough, it is always possible for the consultant to underestimate or overestimate the duration and cost of the project. It is therefore important for consultants to have a very detailed WBS to avoid the possibility of underestimating the duration of the project. Poor inspection and supervision as reported by Kaliba *et al.* (2009) was also identified. It is therefore important for consultants to have qualified and competent staff at the site for proper inspections/supervisions and measurements to maintain the

specified performance requirements of the project and also the issue of delays in the issuance of instructions (Kaliba *et al.*, 2009). Respondents also identified poor communication as one of the key factors causing project delays in Ghana as confirmed by Muhwezi *et al.* (2014). This is true because for projects to be successful, there is the need for proper communication plan accepted by all key stakeholders. It is therefore imperative for consultants to ensure that there is a timely, accurate and adequate communication plan accepted by all key stakeholders during pre-contract, contract and post-contract periods as suggested by Muhwezi *et al.* (2014).

It is very important for contractors to never underestimate the complexity of any project no matter the scale. This is because the research identified the underestimation of the scale of projects by contractors as one of the new factors causing project time overruns. To avoid delays and the associated costs caused by the underestimation of project complexity, slip of schedule and inaccurate estimation, it is important for contractors to deploy competent staff coupled with the right machinery, equipment and tools to the site to avoid delays which in turn increase project costs. The inability of the contractor to access credit was also identified as one of the new issues causing project time overruns. With such government projects in Africa, and for that matter Ghana, the ability of the contractor to access credit can sometimes enhance the progress of the project. From the results, the difficulty on the part of the contractor to access credit was identified as a factor that can affect the duration of the project. It is therefore important for the contractor to ensure that there are enough funds at hand to avoid delays. The management of every project site needs to be very well organized to avoid personality clashes and duplication of instructions which in turn results in delays as identified in this study. To avoid such duplication, it is imperative for the contractor to ensure there are competent staffs designated at the site with the right hierarchy for proper planning and scheduling of the works. This also ensures effective site management and supervision of the works so as to keep a watch on critical activities and strive to complete projects within the specified time whilst meeting quality and cost requirements as suggested by Muhwezi *et al.* (2014). When there are competent staffs on site, the problems associated with improper construction methods, shortage of equipment and tools, poor communication (Sambasivan and Soon, 2007) and misunderstanding are all avoided.

The issue of delays in the issuance of permits was also identified as one of the causes of delays, consistent with the works of Sambasivan and Soon (2007), Assaf and AL-Hejji (2006). Government institutions responsible for the issuance of the necessary permit also ought to find a way to expedite the process to avoid delays, as the delays in the issuance of permits also came up as one of the factors causing delays on the part of government. It is therefore important for government agencies to make these requirements and processes very clear for applicants. When the requirements and processes are very clear, it naturally facilitates the permitting process. Government delays in the form of payments to project implementers Sambasivan and Soon (2007), Assaf and AL-Hejji (2006) was also identified as one of the key factors that affect the cost of projects. It is therefore important for governments to set up an effective project office with the required personnel and funds. This will definitely facilitate the payments for completed work.

In Africa, most construction materials are generally imported, and this in turn, affects the duration of construction projects and the costs, by compelling contractors and clients to exchange huge sums of local currency for the necessary foreign exchange because of the high depreciation of the local currency in most cases. By so doing, contractors and clients are always compelled to go back to the negotiation table to renegotiate for additional funds, causing an increase in project time and costs. To avoid the problems associated with material shortages, escalation in material prices and the delays in material delivery as indicated by

the results, it is important for contractors and clients to either purchase all materials in bulk or look for very good local substitutes of construction materials.

Major disputes during negotiations between stakeholders also came up in this research under contractual arrangement as a factor that leads to project delays. To avoid such contractual delays, it is important for all the stakeholders to meet and iron out all the issues at the pre-contract stage and sign-off on the scope and performance requirements of the project before work commences.

There are other external factors that the research identified as potential factors that can cause delays in projects. The two key ones were the issue of bad weather (Al-Moumani, 2000) and poor economic conditions. It is important therefore for consultants to schedule and commence such projects during dry weather conditions. It is also important for governments to plan and implement very good social and economic policies to avoid the problem with poor economic conditions which always delay the duration of projects.

### **Managerial recommendations**

The result suggests that there are some risk issues that result from the part of clients, consultants and contractors and the need to find innovative ways of dealing with these factors to reduce project time and cost overruns. The authors believe that the mitigation strategies proposed below are necessary for reducing project time and cost overruns in Ghana.

#### *Mitigation measures by clients*

For clients, key issues identified were the issue of unavailability of funds, variations in project scope and designs, delays in the award of contracts and poor communication among project participants. For clients, it is therefore advisable to ensure that there are enough funds before awarding contracts, to avoid variations in designs duration of the construction phase, to avoid delays in the awarding of contracts and decision-making and finally to stay within the communication plans that are accepted by all key stakeholders. If the factors above are avoided, issues of project time and cost overruns resulting from the client side are likely to be avoided.

#### *Mitigation measures by consultants*

For consultants, issues of underestimation of project time and cost should be avoided by developing a detailed WBS. It is also important for consultants to initiate prompt payments, recruit qualified personnel for effective inspections/supervisions and contract management that will help reduce problems with time and costs. In addition, it is important for consultants to avoid delays in the issuance of important instructions, define the scope of the project very clearly, avoid design variations, stay with the accepted communications plans and finally use competent staff to assess the feasibility of the project and its analysis.

#### *Mitigation measures by contractors*

For contractors, to avoid delays and cost overruns, it is important to not underestimate the complexity of any project no matter the scale, look for alternative ways of raising funds, effective site management, use the right construction methods to avoid rework, send the right number of staff to the site and provide them with the necessary machinery, equipment and tools to work with. In addition, contractors are advised to endeavour to hire qualified and competent staff to oversee issues related to estimates, institute proper and effective financial management at the site and be capable of implementing project on schedule.

### *Mitigation measures by other stakeholders*

Government agencies responsible for the issuance of permits are also advised to make the permitting process and requirements very clear to facilitate timely acquisition of relevant permits. The government should set up an effective project office with the required personnel and funds. This will definitely facilitate the payments of completed work. To avoid the problems associated with material shortages, escalation in material prices and delays in materials delivery as indicated in the results, it is advisable that contractors and clients either purchase all materials in bulk or look for very good local substitutes of construction materials. Problems with disputes between parties which was identified as an issue can also be avoided by allowing all the stakeholders to meet and iron out all the issues at the pre-contract stage and sign to agree on the performance and expectations on the key components of the project before project commences. To reduce delays resulting from bad weather, consultants should schedule and commence such projects during dry weather conditions. It is also important for governments to plan and implement very good social and economic policies to avoid the problem with poor economic conditions which always affect the duration of projects.

### **Limitations and future research directions**

The research only considered 58 factors for project time overruns and 27 factors for project cost overruns using only educational sector projects in Ghana. Apart from these factors, there was also the need to look at other factors causing project time and cost overruns. Future studies can also look at other sector projects. It would also be very interesting to have a cross-sectional view of different projects either within the country or in the entire sub-Saharan African region.

### **References**

- Agyakwa-Baah, A. (2007), "Stakeholders' perception of the causes of delay on construction projects", Unpublished B.Sc. Project Dissertation, Kwame Nkrumah Universities of Science and Technology, Kumasi.
- Agyakwa-Baah, A. (2009), "A study into risk assessment and management practices within ghanaiian medium and large construction organizations", Unpublished M.Sc. Dissertation, Built Environment Division, Sheffield Hallam University, Sheffield.
- Ahmed, S., Azher, S., Castillo, M. and Kappagantula, P. (2002), *Construction Delays in Florida: An Empirical Study*, FL.
- Aibinu, A.A. and Jagboro, G.O. (2002), "The effects of construction delays on project delivery in Nigerian construction industry", *International Journal of Project Management*, Vol. 20 No. 8, pp. 593-599.
- Aibinu, A.A. and Odeyinka, H.A. (2006), "Construction delays and their causative factors in Nigeria", *Journal of Construction Engineering and Management*, Vol. 132 No. 7, pp. 667-677.
- Alaghbari, M., Razali, A., Khadir, S. and Ernawati. (2007), "The significant factors causing delay of building construction projects in Malaysia", *Journal of Engineering, Construction and Architectural Management*, Vol. 14, pp. 192-206.
- Alkass, S. and Harris, F. (1991), "Construction contractor's claims analysis: an integrated system approach", *Building Research & Information*, Vol. 19 No. 1.
- Al-Khalil, M. and Al-Gaffly, M.A. (1999), "Important causes of delay in public utility projects in Saudi Arabia", *Journal of Construction Management and Economics*, Vol. 17 No. 5, pp. 647-655.
- Al-Moumani, H.A. (2000), "Construction delay: a quantitative analyses", *International Journal of Project Management*, Vol. 18 No. 1, pp. 51-59.

- Ambituuni, A. (2011), "Five causes of project delay and cost overrun, and their mitigation measures", An article presented to The Robert Gordon University in Partial Fulfillment of the Award of MSc Project Management.
- Amoatey, C.T., Ameyaw, Y.A., Adaku, E. and Famiyeh, S. (2015), "Analysing delay causes and effects in Ghanaian state housing construction projects", *International Journal of Managing Projects in Business*, Vol. 8 No. 1, pp. 198-214, available at: <http://dx.doi.org/10.1108/IJMPB-04-2014-0035>
- Annan, E. (2003), *Causes of Construction Delays in Ghana District Assembly Common Funded Projects in Ashanti Region*, Kwame Nkrumah University of Science and Technology, Kumasi.
- Assaf, S. and AL-Hejji, S. (2006), "Causes of delay in large construction projects", *International Journal of Project Management*, Vol. 24, pp. 349-357.
- Assaf, S.A., Al-Khalil, M. and Al-Hazmi, M. (1995), "Causes of delay in large building construction projects", *Journal of Management in Engineering*, Vol. 11 No. 2, pp. 45-50.
- Ayman, H. and Al-Momani, A.H. (2000), "Construction delay: a quantitative analysis", *International Journal of Project Management*, Vol. 18 No. 1, pp. 51-59.
- Berko, P. (2007), "Project cost overrun in the road construction industry in Ghana", Unpublished M.Sc. Project Management Dissertation, Sheffield Hallam University, Sheffield.
- Bordat, C., McCullouch, B., Labi, S. and Sinha, K.C. (2004), *An Analysis of Cost Overruns and Time Delays of INDOT Projects*, Joint Transportation Research Program, School of Civil Engineering, Purdue University, West Lafayette, IN.
- Bubshait, A. and Al-Juwait, Y. (2002), "Factors contributing to construction costs in Saudi Arabia", *Cost Engineering*, Vol. 30.
- Chimwaso, K. (2001), *An Evaluation of Cost Performance of Public Projects; Case of Botswana*, Department of Architecture and Building Services, Gaborone.
- Choudhury, I. and Phatak, O. (2004), "Correlates of time overrun in commercial construction", *ASC proceeding of 4th Annual Conference*, Brigham Young University, Provo-Utah.
- Dlakwa, M.M. and Culpin, M.F. (1990), "Reasons for overrun in public sector construction projects in Nigeria", *International Journal of Project Management*, Vol. 8 No. 4, pp. 237-241.
- Elinwa, A.U. and Buba, S.A. (1993), "Construction cost factors in Nigeria", *Journal of construction Engineering and Management*, Vol. 119 No. 4, pp. 698-713.
- Enshassi, A., Lisk, R., Sawalhi, I. and Radwan, I. (2003), "Contributors to construction delays in Palestine", *The Journal of American Institute of Constructors*, Vol. 27 No. 2, pp. 45-53.
- Enshassi, A., Mohammed, S. and Abu Mosa, J. (2008), "Risk management in building projects: contractors' perspective", *Emirates Journal for Engineering Research*, Vol. 13 No. 1, pp. 29-44.
- Enshassi, A., Al-Najjar, J. and Kumaraswamy, M. (2009), "Delays and cost overruns in the construction projects in the Gaza strip", *Journal of Financial Management of Property and Construction*, Vol. 14 No. 2, pp. 126-151, available at: <http://dx.doi.org/10.1108/13664380910977592>
- Flyvbjerg, B., Holm, M.K. and Buhl, S.L. (2003), "How common and how large are cost overruns in transport infrastructure projects?", *Transport Reviews*, Establishing Project Risk Assessment Teams.
- Frimpongs, Y., Oluwoye, J. and Crawford, L. (2003), "Causes of delay and cost overruns in construction of groundwater projects in a developing Countries; Ghana as a case study", *International Journal of Project Management*, Vol. 21 No. 5, pp. 321-326.
- Fugar, F.D. and Agyakwah-Baah, A.B. (2010), "Delays in building construction projects in Ghana", *Construction Economics and Building*, Vol. 10 Nos 1/2, pp. 103-116.
- Ghana Statistical Service (2013), *Provisional Gross Domestic Product 2013*, Ghana Statistical Service, Accra-Ghana, September.
- Government of Ghana (2013), *Performance Audit Report of the Auditor General Getfund Funded Infrastructural Projects in Public Tertiary Institutions*, Office of the Auditor General, Accra.



- Jackson, J. (1999), "Facility construction cost overruns: analysis for navy construction contracts", A Report for CE675-, NC State University, Civil Engineering Department, Raleigh, NC.
- Jarkas, A.M. and Haupt, T.C. (2015), "Major construction risk factors considered by general contractors in Qatar", *Journal of Engineering, Design and Technology*, Vol. 13 No. 1, pp. 165-194.
- Kaliba, C., Muya, M. and Mumba, K. (2009), "Cost escalation and schedule delay in road construction projects in Zambia", *International Journal of Project Management*, Vol. 27, pp. 522-531.
- Kaming, P., Olomolaiye, P.O. and Holt, G.A. (1997), "Factors influencing construction time and cost overruns on high-rise projects in Indonesia", *Construction Management and Economics*, Vol. 15 No. 1.
- Kometa, S.T., Olomolaiye, P.O. and Harris, F.C. (1994), "Attributes of UK construction clients influencing project consultants' performance", *Journal of Construction Management and Economics*, Vol. 12, pp. 433-443.
- Koushki, P.A., Al-Rashid, K. and Kartam, N. (2005), "Delays and cost increases in the construction of private residential projects in Kuwait", *Construction Management and Economics*, Vol. 23 No. 3, pp. 285-294.
- Le-Hoai, L., Lee, Y. and Lee, J. (2008), "Delay and cost overrun in Vietnam large construction projects: a comparison with other selected Countries", *KSCE Journal of Civil Engineering*, Vol. 12 No. 6, pp. 367-377.
- Lo, T., Fung, I. and Tung, K. (2006), "Construction delay in Hong Kong civil engineering projects", *Journal of Construction Engineering and Management*, Vol. 132 No. 6, pp. 636-649.
- Lozar Manfreda, K., Batagelj, Z. and Vehovar, V. (2002), Design of Web survey questionnaires: three basic experiments", *Journal of Computer Mediated Communication*, Vol. 7, available at: [www.ascusc.org/jcmcc/vol7/issue3/vehovar.html](http://www.ascusc.org/jcmcc/vol7/issue3/vehovar.html)
- Manavazhia, M.R. and Adhikarib, D.K. (2002), "Material and equipment procurement delays in highway projects in Nepal", *International Journal of Project Management*, Vol. 20 No. 8, pp. 627-632.
- 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*, Vol. 12 No. 4, pp. 254-260.
- Morrow, E., McDonnell, L. and Arguden, R. (1988), "Understanding the outcomes of megaprojects – a quantitative analysis of very large civilian projects", RAND Corporation, Library of Congress Cataloging in Publication Data.
- Muhwezi, L., Acai, J. and Otim, G. (2014), "An assessment of the factors causing delays on building construction projects in Uganda", *International Journal of Construction Engineering and Management*, Vol. 3 No. 1, pp. 13-23, doi: [10.5923/j.ijcem.20140301.02](https://doi.org/10.5923/j.ijcem.20140301.02).
- Nguyen, L., Ogunlana, S. and Lan, D. (1996), *A Study on Project Success Factors in Large Construction Projects in Vietnam*.
- Odeh, A. and Battaineh, H. (2001), "Causes of construction delay: traditional contracts", *International Journal of project Management*, Vol. 20 No. 1, pp. 67-73.
- Odeyinka, H.A. and Yusuf, A. (1997), "The causes and effects of construction delays on completion cost of housing project in Nigeria", *Financial Management Property Construction*, Vol. 2, pp. 31-44.
- Ogunlana, S.O., Prokuntong, K. and Jearkjirm, V. (1996), "Construction delays in fast growing economy comparing Thailand with other economies", *International Journal of Project Management*, Vol. 14 No. 1, pp. 37-45.
- Okpala, C.C. and Aniekwu, A.N. (1988), "Causes of high costs of construction in Nigeria", *Journal of Construction Engineering and Management, ASCE*, Vol. 114 No. 2, pp. 233-234.
- Reips, U.-D. (2000), "The Web experiment method: advantages, disadvantages, and solutions", in Birnbaum, M.H. (Ed.), *Psychological Experiments on the Internet*, Academic Press, San Diego, CA.
- Sambasivan, M. and Soon, Y. (2007), "Causes and effects of delays in Malaysian construction industry", *International Journal of Project Management*, Vol. 25 No. 5, pp. 517-526.

- Shebob, A.N., Dawood, R.K. and Xu, S. (2012), "Comparative study of delay factors in Libyan and the UK construction industry", *Engineering, Construction and Architectural Management*, Vol. 19 No. 6, pp. 688-712, available at: <http://dx.doi.org/10.1108/09699981211277577>
- Sweis, G., Sweis, R., Abu Hammad, A. and Shboul, A. (2008), "Delays in construction projects: the case of Jordan", *International Journal of Project Management*, Vol. 26, pp. 665-674.
- Wa'el, A., Mohd, R.A., Kadir, A.S. and Ernawati, D. (2007), "The significant factors causing delay of building construction projects in Malaysia", *Engineering, Construction and Architectural Management*, Vol. 14 No. 2, pp. 192-206.

### Further reading

- Abd El-Razek, M.E., Bassioni, H.A. and Mobarak, A.M. (2008), "Causes of delay in building construction projects in Egypt", *Journal of Construction Engineering and Management*, Vol. 134 No. 11, pp. 831-841.
- Abdul-Majid, M.Z. and McCraffer, R. (1998), "Factors of non-excusable delays that influence contractor's performance", *Journal of Management in Engineering*, Vol. 14 No. 3, pp. 42-49.
- Alinaitwe, H.M. (2008), "Improvement of labor performance and productivity in Uganda's building Industry", PhD Thesis, Lund University, Lund.
- Alwi, S. and Hampson, K. (2003), "Identifying the important causes of delays in building construction projects", *East Asia Pacific Conference on Structural Engineering and Construction, Bali*.
- Baloyi, L. and Bekker, M. (2011), *Causes of Construction Cost and Time Overruns: The 2010 FIFA World Cup stadia in South Africa*.
- Chan, D. and Kumaraswamy, M.M. (1996), "An evaluation of construction time performance in the building industry", *Journal of Building and Environmental*, Vol. 31 No. 6, pp. 569-578.
- Chileshe, N. and Berko, P.D. (2010), "Causes of project cost overruns within the Ghanaian road construction sector", *Proceedings 5th Built Environment Conference, Durban*, 18-20 July.
- Ghana Statistical Service (2015), *Release of Gross Domestic Product: Quarterly GDP for 3rd Quarter 2014 and Revised Annual GDP Estimates for 2013 and 2014*, Accra.
- Goetsch, D.A. (2013), *Quality Management for Organizational Excellence, Introduction to Total Quality*, 7th ed., Pearson, Upper Saddle River, NJ.
- Long Le-Hoai Young Dai Lee (2009), "Time-cost relationships of building construction project in Korea", *Facilities*, Vol. 27 Nos 13/14, pp. 549-559, available at: <http://dx.doi.org/10.1108/02632770910996379>
- Menesi, W. (2007), "Construction delay analysis under multiple baseline updates", A Thesis Report.
- Morris, S. (1990), "Cost and time overruns in public sector projects", *Economic and Political Weekly*, p. 154-168.
- Nkado, R. (1995), *Construction Time- Influencing Factors: The Contractors' Perspective*.
- Rahman, I.A., Memon, A.H., Abudl Azis, A.A. and Abdullah, N.H. (2013), "Modeling causes of cost overrun in large construction projects with partial least square-SEM approach: contractor's perspective", *Research Journal of Applied Sciences, Engineering and Technology*, pp. 1963-1972.
- Winch, G. (2002), "Partnering and private finance", *Building Research and Information*, Institutional Reform in British Construction.

### Corresponding author

Samuel Famiyeh can be contacted at: [sfamiyeh@gimpa.edu.gh](mailto:sfamiyeh@gimpa.edu.gh)

For instructions on how to order reprints of this article, please visit our website:

[www.emeraldgroupublishing.com/licensing/reprints.htm](http://www.emeraldgroupublishing.com/licensing/reprints.htm)

Or contact us for further details: [permissions@emeraldinsight.com](mailto:permissions@emeraldinsight.com)

Reproduced with permission of copyright owner. Further reproduction prohibited without permission.