

**THE EFFECT OF PROJECT MANAGEMENT PRACTICES ON BUILDING  
PROJECT PERFORMANCE: THE CASE OF THREE ORGANIZATIONS**

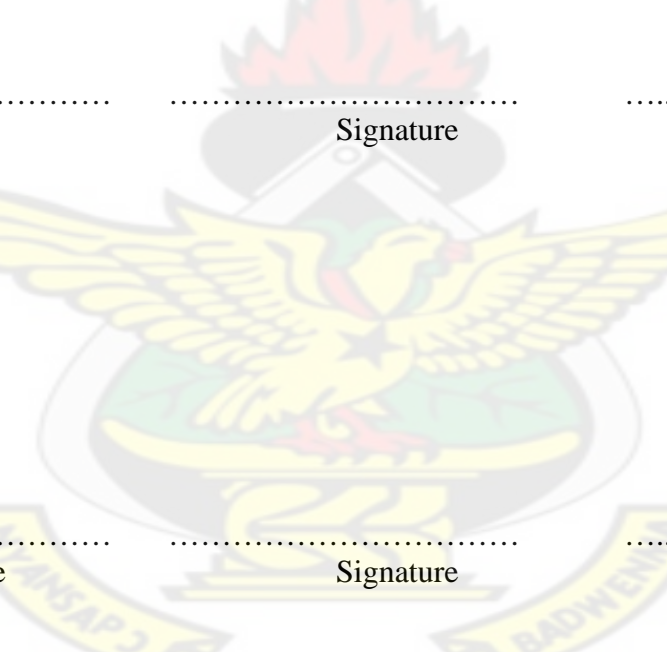
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requirements for the degree  
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## **ABSTRACT**

Performance of building projects is affected by several factors. The focus here is on the relationship between Project Management Practices carried out by Project Management Organizations and project performance. Three organizations involved in the management of projects were thus selected as project management organizations for the study. These are 'GETFund' organization, 'Common Fund' organization and 'SIF' organization.

Three criteria for measuring project performance were identified for their widespread application in project management definition and general understanding amongst practitioners. These include: time, cost and quality criteria.

Semi-structured personal interviews have been carried out within the selected organizations for identification of practices undertaken in the management of building projects. Other significant project management practices were also captured in relevant literature. A structured questionnaire was developed to gather information for measurement of the project performance and determination of project management practices significantly relating to project performance. Performance indices were developed for measurement of the time, cost and quality performance. To test for significant differences between the performance of the categories of projects, each belonging to one organization, a pair-wise analysis, using independent t-tests, was used. Multiple Regression Analysis has been used to determine the relationship between the significant project management practices and project performance.

Considerably, significant difference between the time performance of the categories of projects was observed. There was significant cost performance difference of the categories of projects across all the organizations whilst there was no significant difference in quality performance across all the three pairs of categories of projects analyzed. It was realized that as significant difference exists between the performance of a given pair of categories of projects from organization to organization the corresponding significant project management practices also vary from organization to organization and vice versa.

(Keywords: building projects, project management organization, project management practices, project performance)



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## DEDICATION

# KNUST

To my loving family for their consistent encouragement





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# CHAPTER ONE

## INTRODUCTION

### **1.1 Background**

Execution of building projects is undertaken through management practices carried out by various project managers daily. Specific project objectives are set to be achieved at the end of the project. The objectives may vary from one project to the other. Time, cost and quality objectives are however basic and common to almost all projects; they are discussed in the success subject matter of most projects. [Belassi and Tukel, 1996; Walker, 1995, 1996].

In order to achieve set project objectives, specific Project Management (PM) practices are carried out daily by project managers. It has been argued that the PM practices may vary from organization to organization. Other project managers however argue that since professional practice within the construction industry is required to follow set down guidelines and ethics, PM practices may not necessarily vary from organization to organization; the purpose of adopting a particular practice may therefore be due to peculiar environmental and social demands of the project at hand. Highly satisfactory performance cannot be compromised on and so is the need for optimum practices. As asserted by [Ramabadron *et al.*, 1997], the high performance achieved by a project is what makes a practice adopted optimum.

The factors that affect the individual set project objectives are the ones that confront or promote the project success, outcome or performance. Although project performance is

influenced by several factors [Blismas *et al.*, 2004], this study focuses on the relationship that exists between PM practices and project performance. Performance of a project therefore needs to be measured to pave way for knowing the optimum practices among the lot.

Three organizations in Ghana have therefore been selected for the study. They are regarded as PM organizations in the direction of their having a set of personnel involved in the management of construction projects. Each organization is distinguished from each other by the kind of funding sourced for their development programmes and certain peculiar organizational goals. However, the mission of executing building projects is common amongst them. They specifically include:

- i) Ghana Education Trust Fund ('GETFund') organization
- ii) District Assemblies' Common Fund ('Common Fund') organization: and
- iii) Social Investment Fund ('SIF') organization.

There are certain main organizational goals that are peculiar; Whilst the 'GETfund' organization has the sole objective of supplementing the provision of education at all levels in Ghana, the 'common fund' organization, is set to improve housing schemes, sanitation management and primary health care in addition to improving Ghana's educational facilities. The 'SIF' organization also has the main object of reducing rural and urban poverty. Annually, building projects are undertaken to facilitate achievement of these and other objectives.

In-spite of slight disparity in the specific organizational goals, supplementing and improving educational facilities is common amongst the organizations. This common feature is capitalized upon to pursue the research objectives. The focus is therefore not in the distinguishing features.

## **1.2 Statement of Problem**

- Within the sphere of a given project there are several project management activities. Several ways of carrying out these activities emerge and become accepted as day to day practices. The need to meet certain environmental and social challenges, as may be faced by a particular organization, may cause the adoption of certain PM practices. Personnel involved in project management may also adopt certain PM practices and stick to them for purposes which may however not relate to the project success. Several practices are therefore carried out in the management of projects but not recognized as PM practices.
- The need to obtain successful projects calls for the need to also undertake optimum practices. Knowing the success, or outcome or performance of a project has a great deal of relevance to knowing the optimum practices. The effort put into the measurement of project performance in the country has portrayed little or no help in this direction. The possible, simple and most understanding way of measuring project performance with hard data is therefore needed in this regard.
- Performance of group of projects managed by an organization may differ from performance of another group of projects with similar characteristics but managed

by another organization. The kind of PM practices carried out by the different organizations for achieving project success may also influence variation in the performance of the projects. The significance of such differences in performance of the groups of projects is therefore necessary for determination of the characteristics of influential PM practices.

- There is a relationship between PM practices and project performance [Ramabadron *et al.*, 1997]. Certain PM practices adopted do not necessarily have a significant satisfactory influence on projects performance whilst some have. There would therefore be the need to promote optimum practices and a second look taken at others that confront the success of building projects.

### **1.3 Aim**

The principal aim of this research is to find out the project management practices carried out within the PM organizations that affect building projects performance.

### **1.4 Objectives**

The specific objectives of this research are:

- To identify the project management practices carried out by the organizations for management of the selected building projects
- To measure the time, cost and quality performances of the building projects executed by the organizations

- To determine if the performance of building projects managed by one organization differs significantly from the performance of building projects managed by another organization
- To determine the PM practices that significantly influence the performance of building projects managed by the organizations

### **1.5 Hypothesis**

The performance of building projects managed by one organization differs significantly from the performance of building projects managed by another organization.

### **1.6 Research Methods**

#### **OBJECTIVE # 1**

*To identify the project management practices carried out by the organizations for management of the selected building projects*

Data of the project management practices were collected through personal semi-structured interviews and documentary analysis. Personnel from consultancy firms and clients' organizations involved in the management of building projects within the selected organizations were interviewed. Other data on the PM practices were obtained on a desk-based study basis. Relevant literatures were also studied to aid in getting other PM practices that were not captured by the interview.



## OBJECTIVE # 2

*To measure the time, cost and quality performances of the building projects executed by the organizations*

The first step towards measurement of the performance of the building projects involved the determination of measurement criteria. Three criteria: time, cost and quality objectives have been adopted for the project performance measurement. Therefore time performance index, cost performance index and quality performance index were computed; the time and cost performance were computed objectively by formula, which measured planned against actual whilst the quality performance was subjectively measured by ranking satisfaction with quality of the completed project. Data of projects exhibiting similar features were used for the performance measurement. The main instrument for collection of data for measurement of performance of the projects is structured questionnaire.

## OBJECTIVE # 3

*To determine if the performance of building projects managed by one organization differs significantly from the performance of building projects managed by another organization*

In order to determine the significance of difference between the measured performance of the groups of projects significance testing was required. Therefore the statistical method, independent t-test was adopted. This method was used due to the small number of projects obtained within each organization.



#### OBJECTIVE # 4

*To determine the PM practices that significantly influence the performance of building projects managed by the organizations*

Structured questionnaires were used to gather data of the PM practices that were very significant in influencing the performance attained by each project a respondent gave information on. Each respondent was therefore made to rank, on a 5-point scale of ranking (1 – 5), the level of the significance of effect that each of the identified practice had on the performance of a selected project. Multiple regression analysis was used to determine the relationship between significant PM practices and project performance. The relationship was obtained in light of the three project performance criteria adopted; time, cost and quality.

#### **1.7 Justification of Research**

As several practices emerge for carrying out the management of building projects the need to have knowledge of them and their probable effect on project success also becomes increasingly important. By this knowledge, project managers, client's team members and end users become more aware of both the negative and positive influencing tendencies of daily practices engaged in. Thus, there would be an efficient way of going about controlling and redirecting management efforts so as to achieve higher project success.

A comprehensive assessment of factors that affect construction time, cost and quality objectives of a project is highly necessary in the management process of every project.

Having knowledge of a relationship between project performance and PM practices would greatly enhance such an assessment.

Most construction projects are often said to exceed time schedule and cost budgets. Highlighting the need to continually measure time and cost performance is a step towards increasing awareness amongst project management personnel and project client of the huge loss made through sacrificing project time and cost objectives for other objectives not related to project success.

### **1.8 Scope**

Numerous are the factors that affect project performance. The focus here is on the effect emanating from engaging in certain PM practices. Project performance is considered in the context of achievement of a project's Time, Quality and Cost objectives; it does not include other emerging performance metrics used in the measurement of project performance.

Of the two main sub-sectors in the Ghana construction industry (road and building) the concentration is on the building sub-sector. Of the building projects, too, the focus is on those executed under the 'GETFund' (tertiary school projects), 'Common Fund' and 'SIF' "organizations".

### **1.9 Limitations to Study**

Apart from limited time available for completing the study, respondents were reluctant in providing data required. Both the interviewing and the questionnaire distribution stages

are characterized by initial unwillingness on the part of interviewees and respondents. This was lately overcome through persistence and giving assurance that confidentiality of the projects' time and cost information would be maintained.

### **1.10 Benefits of Study**

The study is will be significant to the development of Project Management in the Country according to the following expected outcomes:

- The study aims at finding out the relationship between PM Practices and Project Performance; by having this knowledge Project team members would accordingly extricate themselves from PM practices that have negative relationship with Performance while engaging more in those that exhibit positive relationship. This would contribute to realizing improved performance of building projects in the country.
- Furthermore, with the information that projects managed by one organization differs significantly from similar ones managed by another organization, and that this is influenced by variation in the PM practices carried out, one organization would be prompted to benchmark relevant practices that would improve the performance of the projects it manages. In the long run, organizations involved in project management in the country would have enhanced quality of PM practices.

### **Glossary of Concepts**

#### ***Project management***

- Ways of carrying out the day to day project

<i>practices</i>	management and administrative activities and decisions from the “cradle” to the “grave” of a project
<b><i>Project Performance</i></b>	- The totality of time, cost and quality performance of a given project
<b><i>Time Performance</i></b>	- The degree to which a project’s time objective is achieved, measured on the basis of a before-and-after effect
<b><i>Construction Time</i></b>	- The number of days from the commencement of work on site to the practical completion point.
<b><i>Cost Performance</i></b>	- The degree to which a project’s cost objective is achieved measured as the “unit cost”
<b><i>Quality performance</i></b>	- The degree to which a project’s quality objective is attained which is subjectively measured on a ranking scale.

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## CHAPTER TWO

### LITERATURE REVIEW

#### ***2.1 Project Management Practices***

##### **2.1.1 Introduction**

According to the ASCE<sup>1</sup> Quality Manual [1987], the discipline of project management can be defined as follows:

“Project management is the art of directing and coordinating human and material resources throughout the life of a project by using modern management techniques to achieve predetermined objectives of scope, cost, time, quality and participation satisfaction.”

The Project Manager, central to the project management process, is also defined as:

“A qualified individual or a firm authorized by the owner to be responsible for the day-to-day management and administration and for coordinating time, equipment, money tasks and people for all or specified portions of a specific project.”

Although quality management is a portion of the management of a whole project, the idea in the work of Das *et al.* [2000] describing quality management practices, is worth noting:

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<sup>1</sup> American Society of Civil Engineers

Quality management practices are described as “the decisions and actions involving quality planning and leadership, quality training etc.” The emphasis in this definition is the concept of management practices involving decisions and actions.

The Oxford Advanced Learner’s Dictionary also gives a relevant definition of “Practices” as:

“Ways of doing something that is the usual or expected way in a particular organization or situation.”

An articulation of the above concepts facilitates defining project management (PM) practices, in this study, as:

‘The day-to-day ways of carrying out management and administrative activities and decisions that is the usual or expected ways of directing and coordinating projects resources by authorized firm or an individual construction professional for the purpose of achieving set project performance in terms of the time, cost and quality objectives.’

Construction professionals within project management teams usually find themselves being part of one of the parties to a building project. The three main parties to a building contract (client, contractor and consultant) form an integral part of the project management team in the construction industry. They all come together to take decisions and carry out activities for the purpose of achieving satisfactory project performance.

Sharma and Gadenne [2002], in their investigation into an inter industry comparison of quality management practices and performance found out that there is a strong association between quality management practices and performance. This finding



provides strong evidence concerning the effect that project management practices have on project performance. An investigation into this relationship is therefore necessary.

### **2.1.2 The Differences in PM Practices**

Management practices vary from organization to organization and the performance of the outcomes is what makes a practice optimum [Bryde, 2003]. The cause of variation in the PM practices may not be only due to the kind of organization but also the type and purpose of project and most importantly the level of performance desired. This observation falls in line with the finding made by Sharma and Gadenne [2002], in an investigation into the effect of quality management practices on performance. They identified through an inter-industry survey of 140 respondents, comprising 58 from the service sector, 62 from the manufacturing sector and 20 from the construction sector, that quality management practices differed somewhat from industry to industry and organization to organization. The focus, though, was on quality performance and not overall project performance. Also, Gowan and Mathieu [2005] in the empirical study of 449 system managers found out that the good Information Systems (IS) project performance depends to a greater degree on the intervention of specific project management practices (formal project methodologies and outsourcing). The project performance was however in the context of meeting project target dates only.

These findings give an indication that the kind of project management practices engaged in for the management of a project depends on the kind of organization. This will hence have a subsequent relation to the project management team composition too. The practices present within different organizations therefore require identification and



further examination. Subsequently, the influence of such practices on the performance of the corresponding projects executed becomes highly necessary to determine. The performance must also not be looked at with a highlight on time only or quality only. The effect will have to incorporate both time and quality not leaving out cost too. These three basic project objectives are fundamental to the totality of project performance.

When practices vary from organization to organization or from project team to project team the question of which practices are the best subsequently arises. Ramabadron *et al.* [1997] describes best practices in project management as optimum ways of performing works to achieve higher performance. The goal of every project manager is to achieve satisfactory performance and it is for this purpose that certain practices are undertaken. In determining whether certain practices are best or not, the need to measure the performance of the projects executed under such set of practices is highly imperative.

### **2.1.3 Certain Organizational practices and attributes**

Several research works have identified certain practices and attributes within an organization, specifically project management firm or team. These practices are carried out for the purpose of successfully managing projects. In a research conducted into the organizational learning practices in project management environment, it was concluded that project organizations should focus on building knowledge because **increased knowledge** is associated with increased project performance [Kotnour, 2000]. Increased knowledge implies not encountering the same problems over and over again and not reinventing solutions to problems. This knowledge helps the organization to better plan a

project and meet cost, schedule, and performance requirements. The learning process must be made to include the practice of taking feed backs for executed projects. In support of this practice Loo [2003] stresses that [taking feedbacks from projects](#) and [learning from experiences](#) have a significant influence on project performance. How important therefore do project managers take knowledge building as an important practice in the management of projects? The presence of encountering the same problems over and over again is an indication of how often low significance is placed on knowledge building, which should include organizational learning and taking feedbacks from projects.

Having certain identified best project management practices within a particular project management organization enhances successful project management. What therefore are some of these best practices identified? Jawaharnesan and Price [1997] studied project management best practices in the UK construction industry and found that “[preparing and organizing](#)” and “[developing project definition](#)” were among the highest ranked tasks or activities. However, taking a look at Bryde’s [2003] assertion, that: “it is the performance that makes a practices optimum”, measurement of project performance is required for determination of optimum practices within a given organization.

#### ***2.1.3.1 Practices in Management of Project Funding***

Client organizations that are entrusted with the management of funds for projects are important organs to consider in the process of project management. The need to have satisfactory project performance makes efficient management of funding for projects imperative. In a research into the management of UK Local competitive funding, it was

found out that increasing bureaucratic processes put an excessive demand on time and resources [Loader, 2002]. Funds usually applied for the execution of projects therefore require efficient management. The [level of bureaucracy](#) involved may be a factor for contractors to consider when bidding for projects. A fore knowledge of the nature of funding source for the project then becomes necessary for putting up strategies to manage building projects. In situations where need for job pushes contractors to bid in spite of foreseeable unfavourable conditions of a given funding source for a project, there is likely to be a subsequent poor performance on the part of the contractor. When projects are faced with the difficulties of irregularity and delay of release of funds for payment of works, the performance is threatened. The kind of practices engaged in managing project funding source is therefore necessary in the discussion of the subject of performance.

Loader [2002] observed that the presence of [tight timescales for preparation of bids](#) is usually an attribute within certain client organizations that have bodies entrusted with coordination of project funding. This situation usually occurs when funds needs to be tapped from its source within a time limit. Pressures are therefore mounted on project consultants to subsequently prepare bids for quick submission. Such schedules place limitations on the preparation of bids resulting in reduction of the level of quality and effectiveness that need to be input; the consequent effects of unforeseen variations retarding the project's progress cannot be overemphasized.

Loader [2002] outlines a number of features that are associated with seeking funding for projects. It has been observed that some of these features present themselves as problems

in the practices undertaken in the coordination of projects funding sources. Few relevant features include:

- Frequent lateness on approvals of application for funding;
- Infrastructure cost not fully estimated in bids and so under funded
- The increasing burden of monitoring successful projects
- Unrealistic management expectations

The presence of some or all of these features in a client's organization has the tendency to yield certain project management practices cultivated with the view of curtailing the challenges posed. The influence of such practices on project performance can therefore not be overlooked when seeking for project success.

#### **2.1.4 Project Management Functions as Practices**

The daily project management functions carried out are for the purposes of managing projects to achieve satisfactory project performance. Each project team member has a function to perform within the project management process. A combination of these functions results in a set of evolved practices within a project's life time. The study of project management practices can therefore not be carried out without taking a look at common project management functions present within the building industry.

##### ***2.1.4.1. The Function of Project Definition***

The function of project definition is highly important. This is made evident in the numerous requirements outlined to be fulfilled at this stage of project development. According to "The Project Definition Rating Index (PDRI) for Building Projects" a project definition, which comes at the pre-project stage, must be adequate and cater for

the type of building project too [PDRI, 1999]. The PDRI also provides a checklist of recommended activities and milestones to define a project scope, which is intended to promote best practices in the building industry. Harris and McCaffer [2005] stress that during the project definition stage, safety measures must be established. The ability of a project manager to carry out the project definition function comprehensively therefore undoubtedly results in best practices. This function is however frequently overlooked in the construction industry.

For the project definition function, a good definition of scope must allow all the parties in the project to understand what is needed and to work towards meeting those needs. The frequency and the extent, to which construction professionals from the parties of consultant and contractors are usually involved in this project development stage, if present, are therefore necessary to know as a PM practice. This will give way to further investigation about how each party regards the importance of the project definition function to the project performance.

#### *2.1.4.2 The Function of Setting Organizational Matters*

The establishment of management structures for the management of a project is one of the important activities required for accomplishing goals. Peter Drucker [1996] argues that management is the function, which involves getting things done through other people. Basically this involves the following, which are all aspects of setting organization matters:

- Getting Managers with leadership capabilities

- Getting staff with competence and appropriate skills
- Placing responsibilities on people for successful completion of the project
- Establishing clear delegated authorities
- Defining proper communication lines

Since these outlined duties relate to the matters concerned with internal organizational running, it may be argued that they are solely for the purpose of improving only organizational performance. Kotnour [2000] asserts that some of the internal organizational matters such as organizational learning practices increase project success too.

The tendency to have the project success increased therefore lies in the ability of the manager to develop certain strategies within the organization. The activity of setting a project organizational structure is, for instance, one of the major organizational matters whose influence on project performance may be significant. It is not only construction companies that are required to set up organizational structure for the management of a project. The nature and functions of organizational structures set up by client organizations especially structures meant to execute payments to contractors therefore require critical examination in order to determine their effect on project success.

#### ***2.1.4.3 The Function of Programming***

The process of managing building projects requires development and monitoring of the programme for the works involved in order to attain success. Harris and McCaffer [2005] buttress that both establishing a challenging but achievable programme and driving the



project to that programme are important activities to carry out as far as achievement of project success is concerned. Whilst establishing of works programme at the initial stage of the project is usually carried out promptly, the monitoring of the programme to achieve project's objectives often experience bottlenecks. The method of monitoring progress of works may have a link with how a project's programme is driven to achieve project objectives. How works progress monitoring is carried out is therefore worth investigating.

#### *2.1.4.4 The Function of Quality Management*

According to Das et al. [2000], quality management practices comprise two sets of activities: the first set comprise decisions and actions internal to the firm. The second deals with other organizations external to the firm. Prominent among the decisions and actions included in the first set is quality planning and leadership and quality procedures. Crosby [1979] also discussed 14 steps in quality management. Some of the steps as may be present within the construction industry include:

- having the commitment of management,
- establishing quality improvement teams,
- measuring quality,
- evaluation of cost of quality,
- creating quality awareness within the organization,
- embarking on regular corrective actions,
- training of supervisors and error cause removal.



Project managers sometimes develop their own peculiar ways of managing to have good quality. Such practices are relevant to the performance of projects.

Deming [1986] advocated that to have a successful implementation of quality management practices, awarding contracts largely based on price should be discouraged. The focus of certain project clients may however not be largely based on quality of the project especially at the pre-contract stage. The cost aspect of contracts is what therefore plays a crucial role in setting the criteria for awarding contracts. Deming's suggestion of improving upon quality of projects needs to be highly considered by construction professionals. When the expectation of client on the quality of the project is usually high, the practice of awarding contracts on the price criteria may not necessarily increase the desired performance of the project.

## **2.2 Project Performance**

The concept of project performance has been a subject of utmost concern to most stakeholders in the construction industry. Projects are expected to perform to achieve set objectives. Satisfactory achievement of the set objectives makes a project successful.

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### **2.2.1 Dimensions of Project Performance**

Project performance has been considered to be tied to project success and this is also tied to project objectives [Chan & Chan, 2004]. Project success has been measured based on different dimensions. Sadeh *et al.* [2000] measured project success based on the following five dimensions:

- Meeting Design Goals
- Benefit to End Users
- Benefit to the developing organization
- Benefit to the defence and national infrastructure
- Overall success (a combined measure for project success)

Shenhar *et al.* [1997] also proposed that project success is divided into four dimensions:

- Project Efficiency
- Impact on Customer
- Business success
- Preparing for the future

Chan & Chan [2004] developed a consolidated framework for measuring project success.

The framework is comprised of the following eight project success dimensions:

Cost

- Environmental performance
- Quality
- User expectation/satisfaction
- Time
- Commercial/Profitable Value
- Health and Safety
- Participants' Satisfaction

There are three basic objectives of Construction projects; time, cost and quality. These objectives are the adopted dimensions for measurement of project performance in this study. Measuring the success based on these objectives is considered to yield effective results since project participants are more familiar with the three basic project objectives. Researchers like [Walker, 1999; Hatush and Skitmore, 1997] have discussed project success around these objectives. The overall performance of any project is invariably an aggregation of the performances of its individual objectives. Based on the widely-known and widely-understood nature of these objectives project performance is measured in terms of time performance, cost performance and quality performance. Nonetheless, construction project success has also been discussed, in few cases, around other project objectives; health, safety and environmental friendliness [Kumaraswamy & Thorpe, 1996], scope [Best & Valence, 1999].

An overriding factor for measuring project performance based on the three basic objectives emanates from the qualitative finding by Phua & Rowlinson [2004] out of their research into how important cooperation is to construction project success. They identified three factors – adherence to project budget, time and quality requirements – as being consistently indicated by interviewees to be the overarching criteria of assessing construction project success. Hence it is highly useful to adopt these objectives to form the basis for the measurement of the building projects performance in subsequent analysis.

### 2.2.2 The Problem of Poor Project Performance

In Ghana, projects have had performance problems. Some of the factors that have contributed to this include irregular release of funds for construction projects by the Client [Baiden-Amissah, 1999]. Amoah-Mensah (2005) in his study into the role of African Quantity Surveyors in the Achievement of NEPAD agenda mentioned delayed payment by client, inadequate contract information and performance appraisal as some of the bottlenecks of optimal realization of the success of construction projects.

The World Bank, in tracking the performance of the District Assemblies' Common Fund (DACF) Projects, identified that the Ministry of Finance has never released the full allocation to the Administrator of the Common Fund. A key finding that stood out as major drawback on the success of the DACF projects is the late release of funds for the projects. It was also indicated that GETFund projects have suffered similar drawbacks. These findings indicate that building projects in the country have experienced performance problems and therefore there is the need to identify PM practices contributing to such drawbacks.

Other literatures also abound with indication of projects in the construction industry having performance problems. The industry is characterized by repeated delays, cost overruns and collapse of buildings [Mansfield et al., 1994]. Best & Valence [1999] contends that the problem of construction projects frequently taking longer and costing more than originally anticipated is often due to poor planning at the pre-design phase of the building procurement process. Post [2001] also attributes the problem of poor project performance to the dominance of the low-bid system of procurement. He argues that this system gives less attention to the quality and performance of the winning contractor.

In light of these Kashiwagi & Parmar [2004] suggested that [past performance information](#) should stand as a key indicator for predicting future performance in the construction industry. Xiao & Proverbs [2003] also contends that [contractor performance](#) is critical to the success of any construction project as it is contractors who convert designs into practical reality. The problem of poor project performance is being attributed to a number of factors here and their effect on project performance has to be ascertained.

Project managers have been called upon to be critical about the [contractor selection process](#) since it is important to project success. Clients in the building industry also select project consultants through a process, thus, based on certain criteria. Ignoring the crucial nature of the project consultant selection procedure may also affect project success. The attributes of project consultants therefore surely has something to do with the problem of project performance. Poor performers produce poor performance whilst good performers produce good performance. Construction professional advisors must therefore know the performers to maintain and the ones to eliminate.

### **2.2.3 Managerial and Administrative Issues & Project Performance**

Rowlinson [1988] found out that a high [level of administrative ability](#) in the project team leads to reduced time overruns, which in turn leads to increased satisfaction of client. The [ability of managers to have managerial control](#) may also be a key element in achieving project success.

Certain administrative processes adopted, especially in the clients' organizations, become established or are changed based on not only the goals to be achieved but also the

administrative abilities of personnel. Certainly, adopted administrative processes have relation with the administrative abilities of administrators. In the administration of contracts, certain administrative processes may have influence on project performance. For instance the effect of process or procedure for payment of contractors for works executed cannot be neglected as far as project success is concerned.

Since administrative ability has been determined to be very essential in the execution of projects the kind of a project management team leader or contract administrator for a particular project also becomes crucial to project success. Smith and Morris [1992] argues that in modern trends of management of building contracts certain management systems incorporated in project management have led to establishment of distinct profession, resulting in further fragmentation of the building process. [Pawley, 1990], following this point, asserts that there is further loss of control of the building process by architectural firms. Such modern systems assure that there is competence in the management of the projects since project management specialists are usually leaders. In contrary instances where solely architectural firm, with no specialized training and experience in project management, becomes the leader of the project team, the project management competence or ability remains questionable. Certain crucial PM practices may be ignored or irrelevant ones may be emphasized and subsequently project success may be affected.



#### **2.2.4 Project Management Structure and Project Success**

The organizational structure adopted for management of building projects is an important area to consider for the success of projects. Weaknesses in this area of project management lead to poor project performance regardless of organizational facilitators such as senior management commitment and leadership style [Cooper, 1998]. Bryde [2003] in his investigation into the formalization of project management activities included the structuring of the project, among four broad areas, that define the success of projects. Loo [2003] also grouped project management activities that facilitate project success under two main areas, which require the establishment of organizations structure for their effectiveness. The areas cover technical (e.g. planning, controlling, and procedures) and people (e.g. leadership, communication, and conflict management). Sidwell [1982] in his investigation into the impact of client decision-making upon construction process and project success concluded that project organizational structure has influence on the project performance from inception to completion.

Getting an organization structure alone is not enough. As much as having an organization structure is important for the achievement of project success as emphasized by Bryde [2003], Loo [2003], Cooper [1998] and Sidwell [1982], the effect of the size of the management structure adopted for management of a project needs to be also given special thought. Also the relevance of the presence of an organization structure to a building project of a particular size should not be given less attention. Another aspect that requires consideration in the project management process is about which of the parties to a building contract should always operate not without project organization structure.



### 2.2.5 Decision-making & Experience and Project Success

Sidwell [1982] in his investigation into the impact of client decision-making upon construction process and project success conclude that there is an influence from the decisions that clients make on the project performance from inception to completion. He added that [the experience of the client](#) with project management process have a lot to do with the kind of decisions that are taken during the lifetime of the project. Some of the decisions made by the project client include insisting on design changes irrespective of the stage of a project. Lack of adequate experience on the part of the client is likely to lead him into ignoring the cost implications of such decisions, especially at the latter stages of the project. Decisions regarding *how much* and *when* allocated funds should be released for payment of executed works or works yet to be executed all may have relevance to the project success. An indication is given by Choudhury & Phatak [2004] who contends that delayed progress payment causes delayed completion of projects.

However, it is not only the client's decisions that are relevant to project success; the decisions of other parties too are important. In a study of 69 projects, Naoum [1994] concludes that the [designer's experience](#) is among the major factors that affect cost and time overruns. The impact of decisions of the contractor too cannot be ignored as far as project success is concerned. Since Sidwell [1982] establishes a relation between experience and decision-making, the experience of the contractor also counts. A Highlight is given by Tam and Harris [1995] concerning the likely impact of experience of the contractor's project manager on time, cost and quality. A look at the point made by Kashiwagi & Parmar [2004] and Xiao & Proverbs [2003] that, consideration of contractors past performance in the project procurement process is necessary for

achievement of project success, buttresses the point that placing high importance on the decision-making and experience of all parties to a building project may be highly significant to project success.

### **2.3 Project Performance Measurement**

In this study, overall project performance is determined based on the performance of the individual basic project objectives: Time performance, Cost performance and Quality performance.

Two main research works that have developed formulae for the measurement of project performance have been identified. Chan & Chan [2004] made use of Key Performance Indicators (KPIs) in his study into the use of key performance indicators for measurement of construction success.

Four major areas, among others, determined the formulae that were adopted for the measurement of project performance. The areas chosen represent the dimensions that were adopted for the measurement. The major dimensions for which formulae were required for their calculation are indicated in table 2.1. One or more indicators were required to measure the performance of each of the dimensions.

Secondly, Ling *et al.* [2002], in developing models for predicting the performance of Design-Build and Design-Bid-Build projects, made use of the performance metrics for measurement of project performance. Similar to Chan & Chan [2004] work, the formulae they adopted for measuring project performance are indicated in table 2.2

Table 2.1 Project Performance Measurement Formulae adopted by Chan & Chan (2004)

Dimension	KPIs	Definition
<i>Time</i>	1) Construction Time =	Project completion date – Project commencement Date
	2) Speed of construction =	Gross Floor area / construction time
	3) Time variation =	((Construction time-Revised contract period) X 100%) / Revised contract period
<i>Cost</i>	1) Unit Cost =	Final Contract Sum / Gross Floor area
	2)Percent Net Variation =	((Net value of variations) X 100 %) / Final Contract Sum
<i>Value and Profit</i>	Net Present Value (NPV) =	$\sum_{t=0}^N (NCF)_t / (1 + r)^t$ <p>where: NCF is Net Cash Flow; and r is the discount rate</p>
<i>Health and safety</i>	Accident Rate =	<p>(Total no. of reportable construction site accidents)</p> <p>/ (Total no. of workers employed or man-hours worked on a specific project)</p>

) X 1000

Table 2.2 Project Performance Measurement Formulae adopted by Ling *et al.* (2002)

Dimension	Performance metrics	Definition
<b>Time</b>	1) Construction Speed =	Area/(as-built construction end date – as-built construction start date)
	2) Delivery Speed =	Area / total time
	3) Schedule growth =	[(Total Time – total as-planned time) / total as planned time] X 100%
<b>Cost</b>	1) Unit Cost =	(Final Project cost/area) / index
	2) Cost Growth =	[(Final project cost – contract project cost)/ contract project cost] X 100 %)
	3) Intensity	Unit cost / total time
<b>Quality</b>	Turn over quality =	Ease of starting up and extent of call backs, Measured by ranking [5=exceed owner's expectation; 1=not satisfactory]
	System quality =	Performance of building elements, interior space and environment Measured by ranking [5=exceed owner's expectation; 1=not satisfactory]

	System quality =	Performance of equipment [5=exceed owner's expectation; 1=not satisfactory]
<b>Dimension</b>	<b>Performance metrics</b>	<b>Definition</b>
	Owner's Satisfaction =	[5=exceed owner's expectation; 1=not satisfactory]
<b>Others</b>	Owner's Administrative burden =	[5=minimum burden; 1=very heavy burden]

The formulae adopted for measurement of project performance include the KPI's: Time variation (for measurement of time performance) and Percent Net Variation (for measurement of cost performance) as employed by Chan & Chan [2004] and originally used by Naoum [1994] and Yeong [1994].

The Time Variation indicator has the ability to take care of percentage increase or decrease in the estimated project days/weeks while discounting the effect of extension of time. The Percent Net Variation indicator also has the ability to give indication of cost overrun or underrun. Moreover, the purpose of these Key Performance Indicators (KPIs), as described by The KPI Working Group [2000], is to enable the measurement of project and organizational performance throughout the construction industry.

The choosing of KPI's are based on certain guidelines as advocated by Collin [2002];

- Only a limited, manageable number of KPI's is maintainable for regular use.  
Having too many (and too complex) KPIs can be time and resource-consuming.
- Data Collection must be made as simple as possible.
- For performance measurement to be effective, the measurement or indicators must be accepted, understood and owned across the organization.

Contrary to the objective ways of measuring cost and time indicated above quality performance measurement has mostly been subjective. For instance a 5-point ranking of owner's satisfaction with the project's quality was employed by Chan & Chan [2004] for measurement of quality performance.

In an investigation into construction time performance, Walker [1995] developed a construction time index for measuring the time performance of 33 projects out of which a regression model was developed for predicting construction duration. The time performance index formula, which is able to tell whether a project is performing below or above trend, appears as:

Planned Construction Period

Actual Construction Period

Similarly, in a study into the influence of Information Technology (IT) utilization on Firm performance in the construction industry, El-Mashaleh *et al.* [2006] also developed an IT index. The index facilitated developing a regression model indicating how IT utilization affects schedule, cost and customer satisfaction of a construction firm. The performance indices exhibit the advantage of portraying underruns and overruns whilst enhancing development of regression model to depict relationships.



## **2.4 Construction Time and the Effect of Certain PM practices**

Construction time refers to the duration for completing a construction project. Projects often experience delays. In an RICS research paper [Morledge et al., 1996] in which data was collected in relation to 215 completed projects of commercial and industrial nature, it was found out that 136 (63%) were delivered late. It was contended that the lateness was mainly due to [unrealistic expectation of clients](#) about the project duration during the pre-construction stage.

One major client in the construction industry is the government. The government usually takes decisions under economic and political considerations. Such considerations may come with directives specifying time periods within which completion of projects are expected. In their bid to comply, members of the project team may be trying to accomplish an unrealistic task. Such situations reflect what Kumaraswamy and Chan [1995] found out in their investigations into determinants of construction duration. They concluded that the overall timescales of many projects appear to be established as a consequence of [commercial and/or political considerations](#). They argued that subsequent planning and programming methodologies are then designed to meet these time targets, rather than any objective assessment of durations. Contractors are therefore made to face increased pressure. Ward *et al.* [1991] also identified that client time expectations are frequently based upon either [their own experience of similar works](#) or on [advice from 'specialist advisors'](#)<sup>1</sup>. This behaviour of clients may be an indication of the adherence to or rejection of advice of project consultants, who have been formally employed to lead

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<sup>1</sup> 'Specialist advisors' refer to certain people having no technical know-how but may advise a client due to certain social or political relationship between them

management of building projects. In situations where project consultants, considered to be project management experts, play the major role in the establishment of construction time, the effect on project performance may be different. The actions of all parties are therefore important to the project performance.

It should however be noted that other factors too bring immense pressure on contractors to complete project on time. Austin *et al.* [1994] identified that increased pressure are brought to bear on contractors to complete projects on time as the result of a [highly competitive market place](#); and that in these circumstances contractors will try their best but that the goals are simply unrealistic. On the other hand when the time is realistic, poor time performance would prompt looking into the level of importance that contractors attach to time goal of projects.

With the use of a web-based instrument prepared to gather data related to the effects of certain variables on time overrun in commercial projects, which was sent to the CEO's of 100 randomly selected construction companies, [delayed progress payments](#) was identified as a major cause of construction time overrun [Choudhurry & Phatak, 2004]. In view of this, the attributes of the nature and source of funds, the main area from which time for payments is mostly determined for building projects, require thorough investigation to know a number of practices that may be causing the delays in progress payments. Although delayed progress payment has been identified as a major cause of construction time overrun, [the ability of the contractor's project manager to deal with the issue](#) is also important to the time performance of the project. The kind of practices that contractors engage in to manage time aspect of the project therefore requires to be identified.

In an investigation into construction time performance of construction projects in Australia, Walker [1995] identified the following as broad factors affecting construction time performance:

- effectiveness of client's representative team
- effectiveness of construction management team
- the scope of works

This gives rise to the need to highlight on certain characteristics of the project management team members too; *their competence, experience, knowledge and skills.*

## ***2.5 Project Cost and the Effect of Certain PM practices***

Cost has been defined as the degree to which the general conditions promote the completion of a project within the estimated budget [Bubashit and Almohawis, 1994]. It covers overall costs incurred from project inception to completion. This highlights the importance that has to be attached to every project management activity carried out through every stage of the project development up to completion. Chan and Chan [2004] also argues that cost is not only confined to the tender sum and that it is the overall cost that a project incurs from inception to completion, which includes any cost arising from variations, modifications during construction period. These cost variables give indication of certain additional practices that when engaged in during the project management process would have both direct and indirect implications for the project cost performance. The *number and manner in which variation orders are issued by consultants* during

construction is an important practice to look at. Clients who often engage in [the habit of agitating for numerous design changes before practical completion](#) also play great role in the influences on project cost. The way contractors respond to variation orders may also have implications for the project performance.

In predicting the performance of design-build and design-bid-build projects, Ling et al. [2002] identified certain variables that affect cost performance. These include: [the number of repetitive elements contained in a project, the extent of design completion when bids are invited, and the level of paid up capital of contractors engaged.](#)

These variables bring to bear certain related practices that may affect the performance of project cost. For instance [the kind of procurement method usually adopted by clients;](#) traditional procurement or design and build will determine the extent of completion of designs to be used for bidding. Moreover the kind of project consultants selected by clients for design of a particular kind of project will also have influence on the way the design will be made (i. e. whether repetitive elements will be brought into the design or not). [The attitude of client towards the project cost](#) will also determine [whether he or she will adhere to the advice given by designers](#) concerning the cost advantage of having repetitive elements in designs. How contractors are usually selected (i. e. [always selecting through competitive tendering or negotiated tendering](#)) will also determine the kind of contractors that are employed to execute the projects.

The presence of certain features within a particular contract also goes a long way to determine the kind of contractors that would tender for the job and eventually win. For

instance the availability of certain facilities (such as [payment of advance mobilization by client](#)) within a given building contract may attract contractors who have low level of paid up capital or low level of ability to pre-finance a project. The level of financial capability of the winning contractor would have bearing on project performance.

## ***2.6 Construction Quality and the Effect of Certain PM practices***

Construction quality is defined as “the totality of the features required to satisfy a given need; fitness for purpose [Parfit and Sanvido, 1993; CIRIA, 1985]. The extent to which projects are monitored, the experience of project consultants, quality and past performance record of contractors [Kashiwagi & Parmar, 2004] and the number of variation orders issued all have effect on quality. How all these factors can be competently coordinated would be relevant to achieving satisfactory quality performance. The project management team leader has the responsibility to ensure that these factors combine well to yield good quality performance.

Quality performance has been considered as a function of the procedures adopted during the construction process [Serpell and Alarcon, 1998]. Those procedures comprise the [concept of procurement form](#) and [the method of tendering](#). The fragmented nature of the construction industry and the fact that every building project is unique places great responsibility on the project management team in setting up the building process that will bring the project to a successful conclusion.

The emphasis here is on process and procedures having influence on quality of a building project. The subsequent issue that arises is how often project managers, having a sense of the uniqueness of every project, tailor certain PM practices to correspond with the



uniqueness of a project in order to yield good quality performance. Some of the procedures to be given recognition may therefore include the [selection procedure of organizations required to perform the design and supervision](#) and [those responsible for the construction](#) of the particular project too. Usually, the construction team would be appointed under competition through competitive [tendering process](#). Sometimes, a contractor may be appointed by negotiation on the basis of a fee. In cases where the design and construction is done as a complete package, both may be let by competition.

The selection procedures applied to contractors are therefore by no means always the same. Different methods have different levels of impact on project success. For instance it was noted from previous research that “competitive tendering can adversely affect the outcome of major projects and the number of separate contracts is related to the chances of success; different selection methods will pose different levels of risk to the project team members” [Chan, 1995]. The selection procedures adopted by clients for project consultants should also not be overlooked since less attention has been given to this aspect of project management by several research works.

In a research work into the factors that influence quality performance of building projects, Chan and Tam [2000], using factor analysis and stepwise regression analysis, identified [project management action by the project team](#) as the most powerful predictor of client's satisfaction with quality. An emphasis therefore needs to be given to the significant practices that are usually adopted by members of the project management team for the quality management of building projects. Other factors mentioned that need to be given the necessary attention included: [effectiveness of the construction team leader](#), the [client's emphasis on quality](#), and the [client's emphasis on time](#).



## Summary

Main findings from the literature include the fact that project management practices involve carrying out the day-to-day management activities and decisions to meet set project objectives. These practices may vary from organization to organization. Optimum practices depend on the level of performance of the outcomes realized. This necessitates finding out of the relationship between PM practices and project performance.

Project performance is considered to be tied to project success and this also is associated with project objectives. Project performance is therefore measured using certain criteria developed based on the project objectives. Project performance has been measured with several dimensions such as: Cost, time, quality, benefit to end users, benefit to national infrastructure, Environmental impact, health and safety requirements etc. Three basic project objectives, time, cost and quality, have been selected as the criteria for measuring project performance. These are considered to be the overarching criteria for assessing project performance.

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## **CHAPTER THREE**

### **RESEARCH METHOD**

#### ***3.1 – General Approach for Research***

Although the choice of research methodology is a difficult step in the research process, the particular approach adopted in any particular research is preceded by critical thought process [Walker, 1996]. The two main methodologies, qualitative and quantitative, were combined in this study. First, there was collection of qualitative data on the Project Management (PM) practices carried out within the selected organizations through interviewing and desk-based study. Second, the qualitative data on the practices were organized into categorical statements and assigned numerical values to enable a quantitative measurement. The effect of the PM practices on measured performance of cases of completed projects were thus determined through quantitative analytical methods; multiple regression analysis. Data for the measurement of project performance and the effect of the practices thereof were obtained through survey questionnaire. Thus by way of step-wise conversion, the qualitative was brought into the quantitative domain (Sarantakos, 2005).

#### ***3.2 – Identification of PM practices***

Data on the PM practices carried out within the organizations was obtained by means of semi-structured questionnaire and desk based study. This was after the following relevant research works have been examined for the purpose of choosing the suitable method:



- A research into the organizational learning practices in a project management environment by Kotnour (2000) in which he used *survey questionnaire* to study the organizational learning practices of practicing project managers.
- Ling et al. (2004) used literature review only to get data on factors that have potential influence on design-build and design-bid-build projects performance.
- In a case-study research into factors influencing project delivery, Blismas *et al.* (2004) used *examination of relevant literature* and *exploratory interviews* to identify factors that influence project delivery. They also employed *Personal semi-structured interviews* and examination of *published documentation*.

Semi-structured questionnaire was employed to gather data on the PM practices of the organizations due to little documentation in literature whilst the desk based study was to enable appropriate identification of practice that could be referred to as project management practice.

### **3.3 – Design of Questionnaire**

The main instrument used for collection of data on projects and the measurement of effects of identified practices on the performance was structured survey questionnaire. Walker (1995) used survey questionnaire to investigate construction time performance of projects in which the sample size chosen was based on its ability to conform to the requirements of the statistical method chosen for answering of the research question. In



order to answer the question: “which PM practices affect project performance?” there was the need to perform regression analysis. Data from all the projects were to be categorized according to which organization they belonged for identification of effective PM practices within each organization. Stratified sampling, where each of the organizations would not be over or underrepresented, was therefore adopted; 33 projects were expected from each organization. In all two major case studies examined: Blismas et. al. (2004) and Chan and Chan (2004), the choice of cases was not based on any statistically derived method. Blismas et. al. (2004) in studying factors influencing project delivery, asserted that: “case studies are not to be viewed as single samples of a population; the aim is not to draw inferences from a sample to a population, but to make findings about linkages and relationships of theoretical importance”. On this basis and in line with the aim of this study a sample of projects was chosen. The cases of projects are from the building sector of the construction industry. Each building project had to exhibit qualities that would enable effective measurement of the *effect* that PM practices have on project performance minimizing certain identified extraneous influences. The following variables therefore had to be kept constant as much as possible.

- Project being substantially completed (i. e. practically completed, handed over, or commissioned)
- To minimize the extraneous influence of project’s financial size on performance, information on projects having original contract sum of not less than ₦500,000,000.00 for the ‘GETFund’ organization and ₦100,000,000.00 for ‘Common Fund’ and ‘SIF’ organizations were obtained. These limits were chosen

based on comments obtained from the interview and questionnaire administered on pilot basis.

- To help minimize the effect on the performance emanating from price fluctuation differences of different economic seasons, projects completed after year 2002 were involved in the survey.
- To minimize the influence of kind of procurement method on performance, project should have been executed under the traditional procurement method.
- To minimize the influence of type of construction, each project had to entirely involve new works.
- To minimize the influence of building-end use, information on only education related buildings were required from respondents.

The data on the projects were acquired from project consultants. Project consultants working on the projects undertaken by the organizations were considered. Those contacted were selected randomly. The questions were structured such as to allow each respondent to give information on the performance and practices all in relation to a single project. More than half of the respondents answered the questionnaire face to face with the researcher. This approach allowed a respondent to, if necessary, fully probe the meaning of questions and reflect upon the nature of answers given. Moreover it allowed general discussion and peripheral comments to be noted to add supporting contextual information.

### **3.4 – Measurement of Projects Performance**

More than one way of measuring project performance was studied. In all, the criteria for measuring the performance would have to be categorically established first. The time, cost and quality objectives were selected as criteria for measurement of the projects performance due to its wide use and understanding as basis for measuring project success. Belassi and Tukel (1996), Hatush and Skitmore (1997) and Walker (1995, 1996) discussed project success using time, cost and quality as the basic criteria. These three indicators were also chosen in consonance with the guideline required for developing Key Performance Indicators (KPIs) as advocated by Collin (2002) that: “Only a limited, manageable number of KPIs is maintainable for regular use; having too many (and too complex) KPI’s can be time and resource-consuming”. Additionally, for the performance measurement to be effective, the indicators must be accepted and understood across the organization. Atkinson (1999) confirms wide use and understanding of the three chosen criteria in the assertion that “whilst other definitions on project management have been developed, the three basic criteria, referred to as the ‘iron triangle’, are always included in the alternative definitions.

#### **3.4.1 Use of Project performance Indices**

Having determined the criteria upon which performance of project was to be measured, a method of measuring each of these three criteria was developed. The method developed involved the use of an 11-point scale, 0.5 – 1.5, indicating the index achieved by a project. Thus each respondent was required to indicate the time, cost and quality performance achieved by a selected project on the respective scale of indices. The indices

were developed based on the construction time performance index (ratio of planned construction period to actual construction period) developed in a study into construction time performance by Walker (1995). Based upon the same trend, cost performance index was also developed to allow respondents indicate the cost performance of the project by dividing initial cost of the project by final cost of the project. Quality performance was similarly measured on an 11-point scale where each respondent was to indicate, in his own estimation, the extent to which the expected quality of the project was achieved; whether the quality was below expectation, as expected or above expectation. The quality performance measurement method is subjective and was adopted based on Chan and Chan's (2004) work in which respondents were required to indicate their satisfaction with quality on a 7-point scale.

The purpose of developing the Indices for measuring all the performance indicators was to enable the regression analysis to be effectively and simply carried out.

#### **3.4.2 Differences in Performance of Projects**

In order to determine the existence of any significant differences between the performance of categories of projects from organization to organization, hypothesis testing was required. The independent t-test method was therefore employed to conduct the test. This implied testing pair-wise (i. e. two categories of projects at a time; each category representing projects within one organization)

### **3.5 – Determining PM practices affecting project performance**

To establish a set of significant practices on project performance, several analytical methods were examined before choosing the multiple regression analysis. Below are outlined the methods that were examined:

- In Blismas *et al.* (2004) research work, significant project delivery influencing factors were identified by performing a cross-case analysis in which the factors were organized into matrices and groups with the aid of NVivo™ computer-aided qualitative data analysis software. The software worked by producing nodes for the construction of matrices used to reduce the data into a manageable format.
- Xiao and Proverbs (2003), in their international investigation into factors influencing contractor performance, used multiple regression analysis to identify the factors influencing Overall Contractors Performance, to establish the relationships between dependent and independent variables, and to determine the relative importance of each independent variable. Performance indicators were established and respondents asked to rank them on a 0 – 10 point scale. The analysis was conducted with the aid of the statistical package for social sciences (SPSS 10).
- In an unpublished M Sc. Thesis, in which investigation was carried out into the causes of delays in construction, Oppong (2003) identified a set of factors contributing to delays in construction from literature. He followed with a survey

conducted to find out from the three main parties in the Ghanaian Construction Industry (Consultant, Client and Contractor) how they rank the factors on a 1 – 5 point scale. He used Relative Importance Indices and significance testing to perform the analyses in order to determine the significant factors.

- In an investigation into construction time performance, Walker (1995) used ANOVA to determine factors that affect construction time performance. He additionally employed regression analysis to develop a model for predicting construction days.
- El-Mashaleh *et. al* (2006) in their study into Construction Firm Performance and IT utilization used regression analysis to determine the impact that IT has on construction firm performance.

In order to achieve the aim of determining the significant PM practices affecting project performance, a relationship had to be established. This required the development of a probabilistic model. Multiple regression analysis was therefore performed to determine the relationship between significant PM practices affecting performance of the projects within each organization.

Thus, within each organization the PM practices significantly relating to time performance, cost performance and quality performance were determined.



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## **CHAPTER FOUR**

### **DATA ANALYSIS AND DISCUSSION**

#### ***4.1 Introduction***

Data gathered from the field are two-fold. The first was data of some of the existing PM practices of the selected organizations. The second set of data was on parameters required for measurement of the performance of selected cases of substantially completed projects and subsequent ranking of the importance of the identified PM practices on the overall performance of building projects within the selected organizations. In both sets of data the respondents were construction professionals involved in the management of building projects. Performance indices were developed for the measurement of time, cost and quality performance whilst a 5-point scale was also developed for measurement of the significance of the effect that the identified PM practices had on each project's performance. The analysis is carried out mainly by use of significance testing and multiple regression.

#### ***4.2 PM Practices identified***

The list of the major PM activities identified is as indicated in Table 4.1. The available different ways of carrying out these activities are what are defined as PM practices. Most of the practices were identified from the face-to-face interview. Some of the practices identified were peculiar to one organization. Other practices were also common amongst two or more organizations. The practices identified are those currently existing. However, from comments made by interviewees, it was noted that some of the practices currently common to two or more organizations had been adopted from other organization(s). For

instance, one interviewee remarked: “the practice of engaging external project consultants through competition was not originally carried out by the ‘SIF’ organization”. Table 4.1 indicates the major PM practices identified and the possible influence that some of them may have on the performance of the projects as observed from the interview.



**Table 4.1 Major identified PM Practices**

PM activity	Practices (ways of carrying out activity)			Comment
	ORGANIZATION			
	GETFund	Common Fund	Social Investment Fund (SIF)	
Project Identification at Pre-design Stage	1. Project identification usually carried out by local school clients (i. e. project end users.)  2. Projects required for fulfillment of specific annual educational development programs are however identified by organization’s head.	1. Occasionally, end users are extensively involved in the identification process.  2. Projects mostly identified in accordance with clients annual infrastructure development programs.	Always end-users are involved in Project Identified through integrated functions with Organization’s appointed project officers	Project may perform better in the long run by involving end users in project identification process since this increases interest in ensuring progress of works. However Unnecessary interruption is possible
Selection of consultants for projects	1. Competitive selection of the consultant is not frequent.  2. Consultants are mostly appointed directly by local client (end users) for individual project.	1. Consultant selection is mostly done competitive through assessment of expression of interest and proposals.  2. Local Client’s in-house construction professionals sometimes serve as sole consultants for certain projects.	Client frequently selects consultants competitively based on submitted expression of interest and proposals for a contract or group of contracts.	Competitive selection of consultant may not be necessary for the success of every individual project.  Engaging client’s team members as project consultant is usually helpful for small-sized projects.
Selection of contractors to execute projects	Contractors bid and are usually selected on open competitive basis irrespective of working experience with client	Contractors bid and are usually selected on open competitive basis irrespective of past working experience with client	Selective tendering is mostly adopted where past working experience with client is very crucial in the selection process.	Projects usually executed by contractors with past working experience with client are said to perform satisfactorily

PM activity	Practices (ways of carrying out activity)			Comment
	ORGANIZATION			
	GETFund	Common Fund	Social Investment Fund (SIF)	
Preparation of bids by consultants	Preparation of bids is mostly based on complete design and within a given time scale by client	Preparation of bids is mostly based on complete design and within a given time scale by client	Preparation of bids is based on complete design and within a given time scale by client	
Determining Winning Bid	Mostly by Merit point System (Price of bid carrying highest point)	Winning bid determined largely based on “Engineer’s Estimate” (i.e. cost of project as determined by consultant)	Determining winning bid is mostly subject to Organization’s predetermined budget (bids with prices higher than budget hardly pulls through)	Cost of the project has the largest influence in determination of winning bid
Pre-financing construction works	1. Contractors mostly pre-finance from own capital base 2. Occasionally Client advances Contractors with mobilization money	Contractors normally take advantage of mobilization advance given by client, usually on percentage of original contract sum basis	1. Contractors normally take advantage of mobilization advance provided by client.  2.Ocassionally, contractors use their own capital	Mobilizing contractors enables quick start and increased progress of work.
Financing of entire project	Project funds is used to bear entire project cost	Project funds is used to bear entire project cost	Entire project cost is borne partly with project funds and partly with end-user’s contribution.	Supplementing cost of project with end-user’s contributions minimizes possible shortage of project funds and subsequent delay of project’s progress
Releasing project funds for payment of works executed	Release of funds by organization is made annually; release of any requested amount exceeding annual budget is made in the following year	Release by project financier is expected to be made quarterly; number of releases within a year is however usually less than four	Release of money for payment of works executed is not made according to a periodic schedule; release is normally made from established budget for a given project to be executed within a given period	Releasing funds according to a periodic schedule is mostly characterized by irregularity and this in turn delays construction



PM activity	Practices (ways of carrying out activity)			Comment
	ORGANIZATION			
	GETFund	Common Fund	Social Investment Fund (SIF)	
Monitoring of work progress	Monitoring is largely carried out through routine inspection normally conducted by project consultant; occasional visit by organization’s technical team is usually done as a response to peculiar problems at certain project sites	Monitoring is largely carried out through routine inspection by consultant. Occasionally, Client’s monitoring team is involved	Monitoring is done by means of specially formatted progress reporting procedure which the project consultant is to regularly comply; progress report is always finalized in conjunction with ‘local clients’ (i. e. the end users)	Monitoring through inspection of the works only in response to peculiar problems may result in poor quality
Valuations of Works for payment	Contractors mostly carry out entire valuation of works for vetting of consultant	Consultants mostly carry out entire valuation of works on behalf of contractor after request is made	Consultants mostly carry out entire valuation of works on behalf of contractor after request is made. However, there are defined stages of work which has to be achieved before valuation is commenced by consultant.	Consultant carrying out entire valuation on behalf of contractor facilitates quicker payment although this is not in favour of normal contract procedures. Vetting of contractor’s submitted claims is however claimed to improve cost performance
Honouring Payment Certificates	Endorsement and cross-checking is done through formally defined procedure involving appointed individuals from client team. (Involvement of organization’s funding secretariat (head office) in the payment procedure is indispensable)	Endorsement and cross-checking is done through formally defined procedure involving appointed individuals from local client’s team.	Endorsement and cross-checking is done through formally defined procedure involving organization’s regional head office and contractors finally receive payments from zonal offices	Delayed payment is claimed to be not necessarily due to bureaucratic payment procedures. Delayed payment, contributing to delayed construction, is said to emanate from non-cooperativeness

PM activity	Practices (ways of carrying out activity)			Comment
	ORGANIZATION			
	GETFund	Common Fund	Social Investment Fund (SIF)	
Making variations in scope of work	Extent to which variations, mostly additions, is made not based on budgeted amount for the project	Allowing for upward variations is not based on project's budgeted amount  Sometimes variations are influenced by end users	Any addition or omission is made mostly by considering budget established for the project	Additions made not based on original project budget is claimed to contribute to poor cost performance
Issuing of Consultant's Instructions	Use of both verbal and written instructions	Use of both verbal and written instructions	Use of both verbal and written instructions	Giving instructions only verbally is mostly characterized by lack of records and this usually results in unbudgeted costs
Contractor carrying out consultant's instructions	Contractors mostly seek confirmation of especially verbal instructions from consultants before execution	Contractors seldom seek confirmation of instruction before execution	Contractors seldom seek confirmation from consultant	Always seeking confirmation before execution is said to improve record keeping and subsequently forestall possible disputes
Educating end users of project on contractual matters	No specific fora or seminars for education	Occasional seminars by project consultants and fora by client	Occasional seminars by project consultants and usual outreach programmes by client team.	Educating end users is said to minimize unnecessary interruption of work whiles increasing quality of progress monitoring
Taking feedbacks from completed projects for improvement of subsequent ones	Through the use of periodic project progress reports on completed projects.	Through the use of periodic project progress reports on completed projects.	Through Desk & Field Appraisals and Project Evaluation	Appraisals are more oriented towards taking feedback than does progress reports

### 4.3 Measurement of Time, Cost, and Quality Performance

The performance of the building projects, as already indicated, is measured in light of the 3 criteria; time cost and quality. The time, cost and quality performance of each project were measured by means of time, cost and quality performance indices respectively on an 11-point scale ranging from 0.5 to 1.5. The time and cost performance indices were obtained by computing from formula whilst the quality performance was subjectively measured by each respondent indicating, in his or her own estimation, the extent to which the quality of the project deviated from what was expected; the margin of deviation being in percentage. The formula and indices are as indicated below in Table 4.2 a, b and c.

Table 4.2 (a) – Time Performance ( $Y_1$ ) Index

Project Completion Status Achieved	Completed behind schedule					Completed on schedule	Completed ahead of schedule				
Index	0.5 and below	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5 and above
$\text{Time performance index} = \frac{\text{Planned Contract Period}}{\text{Actual Construction Period}}$											

Table 4.2 (b) – Cost Performance ( $Y_2$ ) Index

Project Cost Status Achieved	Completed above initial estimated cost					Completed As estimated	Completed below initial estimated cost				
Index	0.5 and below	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5 and above
$\text{Cost Performance Index} = \frac{\text{Initial Project Cost}}{\text{Final Project Cost}}$											

Table 4.2 (c) – Quality Performance ( $Y_3$ ) Index

<b>Project Quality Status Achieved</b>	Below expectation by about:					As expected	Above expectation by about:				
<b>Margin</b>	50% and below	40%	30%	20%	10%		10%	20%	30%	40%	50% and above
<b>Index</b>	0.5 and below	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5 and above

The time performance, cost performance, and quality performance represent the dependent variables in the regression analysis carried out for determination of PM practices influencing performance of the projects. The PM practices are thus the independent variables and these are indicated in Appendix I. The indices represent the points on the regression Y-axis whilst the points of ranking indicating the level of effect of each PM Practice on overall performance, as in Appendix I, represent points on the regression X-axis.

#### **4.4 Response to Data collection**

In all, 108 questionnaires were distributed. Each questionnaire was designed to obtain data on one project and therefore information on 108 projects were expected. The response rate was 61%. Data were obtained on 22 projects from ‘Common Fund’ organization, 20 from ‘SIF’ organization and 24 from ‘GETFund’ organization. Several contacts were made both personally and by means of telephone in order to retrieve the remaining questionnaire. Non-response could be partly attributed to respondents’ complaints about the nature of data being requested; data on completed projects. Such data had to be retrieved from archives and this yielded considerable unwillingness. The

response rate is however acceptable and was used for the analysis. Also, the number of projects obtained meets the requirement of the statistical method used for the analysis.

Most of the respondents belonged to the senior staff level, regarded as the senior management level, in their respective firms. No respondent also indicated lack of understanding of the concepts under study; PM practices and project performance. These background characteristics of the respondents were therefore expected to yield reliable data since the provision of answers, to a large extent, was expected to be approached with enough experience in project management in the construction industry and the element of genuineness.

Appendix II shows the indices and points indicating level of effect of PM practices as obtained project by project within each organization. The table forms the basis for the regression analysis.

Within each organization, information about the performance and PM practices on a project represents that obtained from a single respondent. The performance indices and points for indicating levels of PM practices' effect on performance represent regression plot points; the performance indices are points occurring on the y-axis and points of effect of the PM practices represent points on the x-axis. Three dependent variables and forty-nine independent variables are used in a multiple regression analysis.

#### ***4.5 Overall Trend of Performance of the Projects***

A computed index of less than 1.0 indicates underperformance or below trend whilst 1.0 or above is according to trend or above trend respectively. In order to know the trend of



performance of all projects obtained tables 4.3 (i) – (iii) below gives a descriptive summary of the performance indices obtained project by project.

**Table 4.3 (i) Time performance trend of projects**

Time Index Performance	No. of Projects obtained under:				Percent (%)	Overall Trend Performance		
	GETFund	Common Fund	SIF	Total			No.	%
0.5	13	3		16	24.2	Completed behind schedule	58	87.9
0.6	7	12		19	28.8			
0.7		4	8	12	18.2			
0.8	2		7	9	13.6			
0.9		2		2	3.0	Completed on schedule	8	12.1
1.0	2	1	5	8	12.1			
<b>Total</b>	<b>24</b>	<b>22</b>	<b>20</b>	<b>66</b>	<b>100.0</b>		<b>66</b>	<b>100.0</b>
<b>Mean Index</b>	<b>0.60</b>	<b>0.65</b>	<b>0.81</b>					

**Table 4.3 (ii) Cost performance trend of projects**

Cost Performance Index	No. of Projects obtained under:				Percent (%)	Overall Trend Performance		
	GETFund	Common Fund	SIF	Total			No.	%
0.6	5			5	7.6	Completed above initial budget	39	59.1
0.7	14			14	21.2			
0.8	2			2	3.0			
0.9		12	6	18	27.3	Completed as budgeted	22	33.3
1.0	3	10	9	22	33.3			
1.1			5	5	7.6	Completed below initial budget	5	7.6
<b>Total</b>	<b>24</b>	<b>22</b>	<b>20</b>	<b>66</b>	<b>100.0</b>		<b>66</b>	<b>100.0</b>
<b>Mean Index</b>	<b>0.73</b>	<b>0.95</b>	<b>1.00</b>					



**Table 4.3 (iii) Quality performance trend of projects**

Quality Performance Index	No. of Projects obtained under:			Total	Percent (%)	Overall Trend Performance		
	GETFund	Common Fund	SIF				No.	%
0.9			10	10	15.2	Below expectation	10	15.2
1.0	10	17	2	29	43.9	As expected	29	43.9
1.1	4	5	5	14	21.2	Above expectation	27	41.9
1.2	10			10	15.2			
1.5			3	3	4.5			
<b>Total</b>	<b>24</b>	<b>22</b>	<b>20</b>	<b>66</b>	<b>100.0</b>		<b>66</b>	<b>100.0</b>
<b>Mean Index</b>	<b>1.10</b>	<b>1.02</b>	<b>1.05</b>					

Regarding construction time performance, cost performance and quality performance of the projects, 87.9%, 59.1% and 15.2% performed below trend respectively.

The trend percentages obtained indicates that project performance below trend is prevalent amongst the projects. However, trend of quality performance of all the projects is better than cost and time performance. This may be due to the inclination of clients towards attaining projects of satisfactory quality rather than projects constructed on or ahead of schedule and as budgeted or below budget. There is an indication that whilst time and cost objective can be compromised on, quality is difficult to sacrifice. The mean indices obtained play significant role in the determination of differences in the performance of the projects from organization to organization.

#### **4.6 Determination of Differences in Performance of the Projects from Organization to Organization**

While it is not the aim of the research to identify which organization's category of projects performed better than the other, it is very useful to find out if project performance varies from organization to organization. An Independent  $t$ -test was adopted to perform a two-sample  $t$  statistic test, at a significance level of  $\alpha = 0.05$ , to determine the existence of any significant difference between the performance of the categories of building projects pair-wise; performance of categories of projects within two organizations were compared at a time. Tables 4.4 – 4.6 give results of the test.

The null hypotheses required for performing the test are as follow:

*Performance of the building projects within 'GETFund' organization does not differ significantly from performance of the projects within the 'Common Fund' organization.*

$$\text{i. e. } H_0; \mu_g - \mu_c = 0$$

*Performance of the building projects within 'GETFund' organization does not differ significantly from performance of the projects within the 'SIF' organization.*

$$\text{i. e. } H_0; \mu_g - \mu_s = 0$$

*Performance of the building projects within 'Common Fund' organization does not differ significantly from performance of the projects within the 'SIF' organization.*

$$\text{i. e. } H_0; \mu_c - \mu_s = 0$$

The null hypothesis is rejected when either  $t \geq t_{\alpha/2, m+n-2}$  or  $t \leq -t_{\alpha/2, m+n-2}$

Where  $\mu_g$  represents sample mean for GETFund organization

$\mu_c$  represents sample mean for Common Fund organization

$\mu_s$  represents sample mean for SIF organization

$t$  represents the calculated  $t$

$t_{\alpha/2, m+n-2}$  represents  $t$  obtained from tables

The  $t$ - tests have been conducted 2-tailed at an  $\alpha$ -significance level of 0.05. Hence, a computed significant value less than 0.05 implies that there is significant difference between the performance of the two grouping variables under test.

From Table 4.4, significant values as well as  $t$  values obtained indicate that the time performance of the projects within the 'GETFund' organization does not differ from that of 'Common Fund' organization whilst between the 'GETFund' and 'SIF' organizations there is a significant difference in the time performance of the respective categories of projects. Similarly between the 'Common Fund' and 'SIF' organizations significant difference between the time performance of their respective projects is exhibited.

Table 4.5 shows that the cost performance of the projects within one organization differs from the other two.

With regards to quality performance, Table 4.6 reflects lack of general differences amongst the organizations. Whilst the quality performance of projects managed by the 'GETFund' organization differs from that of the 'Common Fund' organization, there is no significant difference when it comes to the 'GETFund' and the 'SIF' as well as the 'Common Fund' and the 'SIF'. The occurrence or non-occurrence of performance differences may be due to a number of factors. However, the focus here is on the aspects relating to PM practices undertaken within the organizations.

Table 4.4 (a) Independent Samples T-Test with Time performance as Test Variable

Grouping Variable	t-test for Equality of Means				Conclusion	Decision
	$t_{\alpha/2, m+n-2}$	T	df	Sig. (2-tailed)		
'GETFund' and 'Common Fund' Organizations	2.021	-1.294	44	0.202322	Fail to Reject Null Hypothesis	Time Performance difference NOT SIGNIFICANT
'GETFund' and 'SIF' Organizations	2.021	-5.101	42	0.000008	Reject Null Hypothesis	Time Performance difference SIGNIFICANT
'Common Fund' and 'SIF' Organizations	2.021	-4.117	40	0.000187	Reject Null Hypothesis	Time Performance difference SIGNIFICANT

#### Release of Funds for Payments

A common practice witnessed among the 'GETFund' and 'Common Fund' organizations is the release of funds for the projects according to a periodic schedule. Irregularities and delays are found to be usually associated with the disbursement of the funds this way and projects subsequently experience delays due to inability of clients to honour payment certificates. The 'GETFund' and 'Common Fund' organizations have this practice of periodic release of project funds in common and this may explain why there is no significant difference found between the time performance of their respective projects.

There is a significant difference between the time performance of 'SIF' projects and the other two organizations. An observation made to which this difference may be attributed is that whilst the 'GETFund' and 'Common Fund' organizations make payments as and when funds are released, the 'SIF' organizations makes payment from a central source as

and when projects require funds to continue since budget for that particular project would have been initially established by the organization. The practice is said to minimize the occurrence of delay in payment usually associated with irregularities in periodic release of funds for the project.

### **Financing of Entire project**

Whilst the 'GETFund' and 'Common Fund' organizations finance an entire project with only funds marked from a single source of the organization, the 'SIF' organization supports the financing of the project with part contributions from the project end users.

Supplementing cost of project with end-user's contributions is said to minimize possible shortage of project funds and thus subsequent delay of project's progress is curtailed. The financing of projects carried out differently by the 'SIF' organization from the other two organizations explains why the time performance of its projects also differs from the other two organizations.

### **Project Identification at Pre-design Stage**

Building projects identification, as carried out within the 'GETFund' and 'Common Fund' organizations, is either by the end users or as a result of fulfilling an annual development programme by the organization. The identification by the end users only is not known to follow a specific laid down procedure. However within the 'SIF' organization, end users are extensively involved in identification of projects. This identification procedure follows laid down integrated functions, which are to be formally carried out by appointed organization's officers in conjunction with the end-users. This

practice of identification of projects carried out differently by the 'SIF' organization may also explain the time performance differences occurring in table 4.4

### **Taking Feedback from Completed Projects**

In taking feedback from completed projects for performance improvement of subsequent ones the 'SIF' organization uses the methods of Desk & Field Appraisals and Project Evaluation rather than reference to project progress reports prepared during execution of the project. The use of appraisals and/or evaluation for taking feedback is said to be more oriented towards project performance improvement. The time performance of project fed with information through this method would therefore perform differently from a project in which a different method is used.

Table 4.5 Independent Samples t-test with Cost performance as Test Variable

Grouping Variable	t-test for Equality of Means				Conclusion	Decision
	$t_{\alpha/2, m+n-2}$	T	df	Sig. (2-tailed)		
GETFund and Common Fund Organizations	2.021	-8.04176808	44	3.5138E-10	Reject Null Hypothesis	Cost Performance difference SIGNIFICANT
GETFund and SIF Organizations	2.021	-8.76774276	42	4.8821E-11	Reject Null Hypothesis	Cost Performance difference SIGNIFICANT
Common Fund and SIF Organizations	2.021	-2.504	40	0.016455	Reject Null Hypothesis	Cost Performance difference SIGNIFICANT



### **Valuation of work done for payments**

In contract administration, normally, contractors are required to initiate valuation of works for subsequent vetting and approval of consultant. This is witnessed within the GETFund organization. Often, within the Common Fund organization, the consultant carries out an entire interim valuation on behalf of contractor after request is made by the contractor. Similarly the SIF organization does same but not until the work reaches a defined stage. The interim valuation of works within a project is very crucial in the determination of the ultimate cost of the project and how this is carried out is equally important. As observed, the process and condition for valuation of works across all the organizations is not the same and this could also account for the significant difference in cost performance of their respective projects.

### **Making Variations in Original Scope of Works**

Table 4.5 gives an indication that the cost performance of the category of projects within one organization differs from the other organizations. Varying original scope of works is observed to be carried out differently by all the organizations and therefore the significant difference in cost performance of the projects from all the organizations could be partly attributed to this. Similarly Walker (1995) identified that scope of works have effect on project performance. The extent to which the 'GETFund' organization adds onto scope of work is mostly based on quality and design requirements of clients. Whilst the SIF organization's variation in scope of work is largely budget-based the 'Common Fund organization's variations are sometimes end-user driven. The issue of variation playing a major role in the cost performance of the projects from all the organizations is in favour

with Chan and Chan (2004) study in which they defined Cost of project with variation as a major component from which the cost of project is determined.

### **Consultant Selection**

In selecting consultants for projects the 'GETFund' organization mostly appoints (i. e. non-competitively). The 'Common Fund' organization often combines both the competitive and non-competitive methods to select consultants for individual contracts whilst the SIF is lately observed to select consultants mostly by competitive methods either for an individual contract or series of contracts. No method of selection is said to be best for all situations. The consultant selection system was found to be different for all the organizations and this could also account for the cost performance difference observed across all the organizations.

### **Determining Winning Bid**

The Merit Point System in evaluation of bids is mostly used by the GETFund organization. Within the 'Common Fund' determining winning bid is largely based on cost of project as estimated by consultant. The basis for selecting winning bid as is done within the SIF organization is slightly different from the above two methods as this is mostly influenced by organization's budget established for the particular project. The price of winning bid has a lot to do with the cost performance of a given contract and therefore this difference in the practices across all the organizations could account for the cost performance differences observed.

Table 4.6 Independent Samples t-test with Quality performance as Test Variable

Grouping Variable	t-test for Equality of Means				Conclusion	Decision
	$t_{\alpha/2, m+n-2}$	T	df	Sig. (2-tailed)		
'GETFund' and 'Common Fund' Organizations	2.021	3.555	44	0.001	Reject Null Hypothesis	Quality Performance difference SIGNIFICANT
'GETFund' and 'SIF' Organizations	2.021	1.044	42	0.302	Fail to Reject Null Hypothesis	Quality Performance difference NOT SIGNIFICANT
'Common Fund' and 'SIF' Organizations	2.021	-0.592	40	0.557	Fail to Reject Null Hypothesis	Quality Performance difference NOT SIGNIFICANT

The quality performance of the projects were subjectively measured and it was satisfaction with quality that was rated. The satisfaction of, most importantly, the client with the quality of the project executed is what all parties within a given project ultimately give high consideration therefore when the client is satisfied other members within the project team would invariably be satisfied. Hence, most of the practices relating to quality performance were therefore expected to be client-dominated since the ultimate concern of the client is usually said to be quality.

### **Pre-financing of Construction Works**

In pre-financing of construction works it was observed that either the contractor would use his own capital or the client would advance the contractor mobilization money.

Within the 'GETFund' and the 'SIF' organizations the combination of these two ways of

pre-financing are usually used. However the advancing of mobilization loan by the client to the contractor is found to be more frequent within the ‘SIF’ organization than in the ‘GETFund’ organization. The ‘Common Fund’ organization has this practice of the client providing advance mobilization loan in common with the ‘SIF’ organization.

Where the client advances mobilization, he is said to demand more from contractor from the beginning of the project than where he has not made such provision. The expectation may be realistic or not and this can influence the quality of work executed. The quality performance difference being realized out of the significance testing in table 4.6 could be attributed to this phenomenon. This observation buttresses Naoum’s (1994) finding that the client’s expectation have effect on project performance.

### **Honouring of Payment Certificates**

In a normal process of honouring of payment certificates, the client’s team has appointed individuals who cross-check and endorse before contractor receives payment. The GETFund and SIF organizations have it in common that the involvement of their national/regional head office/secretariat in this process is central. Contractors have however reported that this process has not been characterized by delays and hence they are usually motivated to execute satisfactory work. This may also add to the reasons why there is no significant difference between the quality performance of their respective projects. With the Common Fund organization, the involvement of national head office/secretariat of the organization is not integral in the process. However, contractors usually report delays with this process and are usually not motivated to execute satisfactory work where there is excessive delay with payment.

The significant quality performance difference between the ‘GETFund’ and ‘Common Fund’ organizations’ respective projects may be attributed to these occurrences.

### **Issuing and execution of site Instructions**

Across all the organizations, site instructions from consultant are normally issued by both verbal and written means. Where the instruction is verbal, contractors are contractually required to confirm before execution to serve as adequate reference in the event of poor execution of the instruction. Before execution of the site instructions, most contractors working on the GETFund organization are said to frequently seek confirmation whilst those working on ‘Common Fund’ seldom do so. This may be responsible for the existence of significant difference between the quality performance of their respective projects. In some instances it is also reported that contractors take instructions from construction supervisory personnel from the client’s team without the approval of consultant on the project. This practice is not observed with the GETFund organization.

### ***4.7 Determination of Significant PM practices***

The obtained performance differences between some paired organizations as well as the lack of difference in performance of some paired organization have all been observed to have influences from certain PM practices. A regression analysis was performed, using the stepwise method, to determine the PM practices that significantly affect performance of the building projects within each of the three organizations. Tables 4.7 (a) to 4.7 (c) indicate PM practices that significantly influence Time performance, Cost performance and Quality Performance within each of the organizations. The regression has been run at an  $\alpha$ -significance level of 0.05.



The Beta coefficients give an indication of the contribution of each of the significant PM practices, the significant independent variables, in a model. A model is developed for each organization. The significance values denoted by (Sig.) are all less than 0.05, the significance level at which the regression was run. And this is what indicates that they have significant effect on the individual dependent variables. The adjusted R-square value also shows the percentage of variation of a dependent variable that the model explains. For instance, from Table 4.7 (a), it was found that the 84.7% of variation in time performance of building projects obtained from the ‘GETFund’ organization can be explained by the model.

**Table 4.7 (a) Regression Analysis of Time performance (Y<sub>1</sub>) on PM practices: Summary**

<i><b>Organization</b></i>	<i><b>Variable</b></i>	<i><b>Significant PM Practice</b></i>	<i><b>Beta</b></i>	<i><b>Sig.</b></i>	<i><b>Adjusted R-square of model</b></i>
GETFund	X <sub>41</sub>	Contractor first preparing claims for every interim valuation for subsequent vetting of consultant	0.843094	1.87E-05	0.847
	X <sub>45</sub>	Contractor confirming all instructions, verbal or written before executing	0.287525	0.003805	
	X <sub>10</sub>	Consultant preparing the bid under given time period by client	-0.17349	0.0191	
	X <sub>23</sub>	Selecting the contractor through pre-qualification based on previous working experience with client	0.141051	0.041205	
Common Fund	X <sub>18</sub>	Assessing and awarding of contract by merit point system	1.095824	4.58E-05	0.764
	X <sub>23</sub>	Selecting the contractor through pre-qualification based on previous working experience with client	0.473741	0.00056	
SIF	X <sub>1</sub>	End users themselves being allowed to identify the project	-0.3	.	0.893
	X <sub>30</sub>	Client and consultant jointly inspecting works on all occasions of site visit to monitor progress	-0.00074	.	

Dependent Variable: Time performance



From the regression analysis the PM practices significantly affecting the time performance of the projects obtained from the 'GETFund' organization include:

1. *“Contractor first preparing claims for every interim valuation for subsequent vetting of consultant”*;
2. *“Contractor confirming all instructions, verbal or written before executing”*;
3. *“Consultant preparing the bid under given time period by client”*; and
4. *“Selecting the contractor through pre-qualification based on previous working experience with client”*

A positive Beta-value gives an indication that there is a positive relationship between the PM practice and the Performance and a negative Beta-value negative relationship. Thus the PM practice, *“Consultant preparing the bid under given time period by client”*, as carried out within the 'GETFund' organization was found to have a negative relationship with Time performance. The implication is that on building projects that the time performance was poor, consultants were mostly made to prepare bids under a given time period. On the other hand on projects that there was increased time performance contractors usually first prepare their claims, for every interim valuation, in order for consultants to subsequently vet.

The PM practices that were found to have significant influence on time performance of projects within the 'Common Fund' organization include *“assessing and awarding of*

*contract by merit point system” and “Selecting contractors through pre-qualification based on previous working experience with client”.* The latter also occurred within the ‘GETFund’ organization as a significant PM practice similarly having a significant positive relationship with time performance of the respective projects. Thus, for both organizations, there is an indication that clients are more comfortable working with contractors that they have previous working experience with in order to realize satisfactory performance. The issue of both organizations having a common significant PM practice affecting time performance may partly explain why there was no difference in the time performance of projects managed by both the ‘GETFund’ and ‘Common Fund’ organizations as obtained from the *t*-test.

In the management of the projects obtained within the ‘SIF’ organization, two PM practices: *“End users themselves being allowed to identify the project”* and *“Client and consultant jointly inspecting works on all occasions of site visit to monitor progress”* were found to have significant effect on time performance; their effects being negative. It can be inferred that, poor time performance of the projects examined within the ‘SIF’ organization were mostly due to the presence of these practices, all other factors being equal.

By observing across all the three organizations, none of these two significant PM practices of the ‘SIF’ organization occurred within the other two organizations. A backward look at the *t*-tests also indicates that the time performance of projects within the ‘SIF’ organization differ from that of projects within the other two organizations. Thus, the significant PM practices within the ‘SIF’ differing from the other two organizations could also partly account for the time performance differences obtained in Table 4.4

**Table 4.7 (b) Regression Analysis of Cost performance (Y<sub>2</sub>) on PM practices: Summary**

<i>Organization</i>	<i>Variable</i>	<i>Significant PM Practice</i>	<i>Beta</i>	<i>Sig.</i>	<i>Adjusted R-square of model</i>
GETFund					0.585
	X <sub>26</sub>	Contractor pre-financing works from own capital base	-0.84637	1.26E-05	
	X <sub>23</sub>	Selecting the contractor through pre-qualification based on previous working experience with client	0.632258	1.6E-05	
	X <sub>25</sub>	Client providing advance mobilization to prefinance from project fund to contractor	0.248441	0.000636	
	X <sub>22</sub>	Selecting the contractor on open competitive basis	0.288068	0.003258	
Common Fund					0.805
	X <sub>13</sub>	Choosing staff for projects based on specialization demands of project	1.224745	1.7E-05	
	X <sub>4</sub>	Determining the project to be executed based on political considerations	0.5	0.009679	
SIF					0.970
	X <sub>1</sub>	End users themselves being allowed to identify the project	-0.1	.	

Dependent Variable: Cost performance

Of all the PM Practices carried out by the ‘GETFund’ organization in the management of the building projects the practices: “*Contractor pre-financing works from own capital base*” was observed to have the most significant influence on cost performance of the respective projects. The relationship is however negative, portraying that the practice was

more prominent as the cost performance of the projects reduced. Within the 'Common Fund' organization choosing staff for projects based on specialization demands of project stood out as the most significant PM practice contributing to increased cost performance. An explanation to this could stem from the fact that specialized construction professionals have more experience and are therefore able to work efficiently eventually resulting in cutting down cost. The PM practice of "end users themselves being allowed to identify projects before its execution" was found to be the only practice significantly impacting cost performance of projects within the SIF organization. Moreover, the practice was identified to have a downward relationship with cost performance.

A thorough examination of Table 4.7 (b) shows that none of the significant PM practices affecting cost performance is common amongst at least two of the organizations. Correspondingly, the t-test indicated that cost performance of the projects within one organization differed from the other two. The implication here is that as the significant PM practices affecting cost performance of the projects differ from organization to organization the cost performance of the respective projects also differs significantly from one organization to the other.

**Table 4.7 (c) Regression Analysis of Quality performance (Y<sub>3</sub>) on PM practices: Summary**

<i>Organization</i>	<i>Variable</i>	<i>Significant PM Practice</i>	<i>Beta</i>	<i>Sig.</i>	<i>Adjusted R-square of model</i>
GETFund					0.484
	X <sub>11</sub>	Basing time for preparation of bid on completion of design	-1.2397	0.00000763	
	X <sub>6</sub>	Selecting project consultants competitively	-1.07882	0.00000904	
	X <sub>7</sub>	Basing consultant to be selected on project financial size	2.046036	0.00004692	
	X <sub>40</sub>	Procedure for payment involving both client team members and consultant	-1.06366	0.00013642	
	X <sub>11</sub>	Client obtaining project funds on annual basis	0.30839	0.00177555	
Common Fund					0.870
	X <sub>41</sub>	Procedure for payment involving only client's team members	1.001	0.00036416	
SIF					0.980
	X <sub>30</sub>	Client and consultant jointly inspecting works on all occasions of site visit to monitor progress	2.96E-16	0.00567881	
	X <sub>49</sub>	Contractor carrying out instruction from client's project team without confirming from consultant	-0.2	0.00000006	

Dependent Variable: Quality performance of project

From the regression analysis, the PM practice of “Basing time for preparation of bid on completion of design” was identified to have the most significant influence on the quality

performance of the projects within the ‘GETFund organization’. It is important to note that the client normally controls time for preparation of bids. Selection of project consultants is also done by the client. This activity, undertaken competitively, was found to have negative influence on quality performance of the projects within the GETFund organizations. Practices related to making payment to contractors, which is largely controlled by the client, were found to have significant impact on quality performance of the projects obtained from both the ‘GETFund’ and ‘Common Fund’ organizations. The PM practices influencing quality performance of projects obtained from the ‘SIF’ organization are: *“Client and consultant jointly inspecting works on all occasions of site visit to monitor progress”* and *“Contractor carrying out instruction from client's project team without confirming from consultant”*. It is also necessary to note that these practices are also client-dominated.

An observation of the nature of all the PM practices significantly relating to quality performance of the projects obtained from all the three organizations reveal the presence of a common characteristic; the dominance of the client. Hence here is an indication that the client has a major role to play when it comes to realization of a given quality performance of a project. The subjective nature of quality of projects is also revealed here since it is the client who would eventually determine whether the quality performance of the project has been satisfactory. Furthermore, from the t-test, there was no significant difference in quality performance of the projects across all the three organizations except between the GETFund and Common Fund organization. This may be explained by the presence of the common characteristic of client having major involvement in the practices influencing quality performance of the projects within all the organizations.



Thus as the PM practices exhibited a common characteristic, the quality performance thereof likewise exhibited no much difference across all the organizations.

It has been observed that as performance differs from organization to organization the significant PM practices influencing the performance also vary from organization to organization and vice versa.



## **CHAPTER FIVE**

### **CONCLUSIONS AND RECOMMENDATIONS**

#### ***5.1 Introduction***

The principal aim of this research is to find out the project management practices carried out within the PM organizations that affect building projects performance. Four objectives were thus set out in order to achieve this aim:

- To identify the project management practices carried out for management of the selected building projects within the organizations
- To measure the time, cost and quality performances of the building projects executed within the organizations
- To determine if the performance of building projects managed by one organization differs significantly from the performance of building projects managed by another organization
- To determine the PM practices that significantly influence the performance of building projects within the organizations

#### ***5.2 Identified PM practices***

Table 4.1 indicates the identified project management practices prevailing amongst the organizations. Whilst some of the practices are peculiar to one organization others are common to two or all the organizations. PM practices such as: Contractor pre-financing works with money either than advance mobilizations provided by the client; obtaining

project funds quarterly; and monitoring progress of works jointly between project consultant and local clients in conformance with specially developed project monitoring progress reporting format were peculiar to the ‘GETFund’, ‘Common Fund’ and ‘SIF’ organizations respectively. The practice of bearing entire project cost with support from local clients too is identified to be peculiar to the ‘SIF’ organization. Other PM practices: “selecting project consultants competitively”, “selecting contractors through open competitive tendering” etc. are common amongst all the three organizations.

From the interview, all the practices possessed some amount of potential effect on project time, cost and quality objectives.

### ***5.3 Measured project performance***

A trend of project performance was obtained from computation of time, cost and quality performance of the projects within each organization. With regards to time performance 87.9%, out of the 66 projects obtained from the organizations, was below trend; these projects completed behind schedule. Also, 50.1% of the projects was completed above budget; performed below trend. With regards to quality performance only 15.2% of the projects performed below trend. Satisfaction with the general quality of the projects was found to be high.

### ***5.4 Comparison of Performance of the Projects between the Organizations***

The observation of existence or no-existence of significant differences between the projects studied within the three organizations has been done pair-wise using the

independent t-test. Where significant difference is found it was also observed that the respective significant PM practices also varied and vice versa.

#### **5.4.1 Difference in Time Performance of the Projects**

From table 4.4, the test for equality of means with time performance as the test variable indicate that the time performance of the projects within the 'GETFund' organization does not differ significantly from those within the 'Common Fund' organization. The time performance of the projects obtained from the 'SIF' organizations is significant different from all the other organizations. The difference occurring have been observed to emanate from differences in practices regarding: release of project funds, entire financing of project and the honoring of payment certificates

#### **5.4.2 Difference in Cost Performance of the Projects**

The independent t-test in table 4.5 indicates that there is significant difference in the cost performance of projects across all the three organizations. The significant difference observed have been found to emanate from differences in practices concerning: varying of original scope of works, consultant selection, determination of winning bid and the interim valuation of works.

#### **5.4.3 Difference in Quality Performance of the Projects**

The Quality performance of the projects studied under the 'GETFund' organization is not significantly different from the projects within the 'SIF' organization. This is similar with the projects studied under the 'Common Fund' and 'SIF' organizations. The Quality performance of the projects within the 'GETFund' organization studied significantly differed from the projects

managed by the ‘Common Fund’ organization as shown in Table 4.6. This significant difference is observed to mostly stem from the practice relating to pre-financing of the construction works, the honouring of payment certificates, and execution of site instruction.

## **5.5 Significant PM Practices affecting Project Performance**

### **5.5.1 Significant PM Practices relating to Time Performance of the Projects**

The regression analysis in table 4.7 (a) revealed that the model indicating significant PM practices relating to time performance can explain 84.7%, 76.4% and 89.3% of variation in the time performance of the projects studied under the ‘GETFund’, ‘Common Fund’ and ‘SIF’ organizations respectively.

Not all the significant PM practices have positive relationship with the time performance of the projects within the ‘GETFund’ organization. However all the significant PM practices relating to time performance of the projects within the ‘Common Fund’ organization were found to exhibit positive relationship whilst those within occurring within the ‘SIF’ organization exhibited negative relationship.

A common PM practice of selecting contractors through pre-qualification largely based on previous working experience with client was observed to have significant effect on the time performance of the projects studied under both the ‘GETFund’ and ‘Common Fund’ organizations. However, between the ‘GETFund’ and ‘SIF’ organizations as well as between the ‘Common Fund’ and ‘SIF’ organizations, all the PM practices significantly

relating to time performance of their respective projects varied from organization to organization.

### **5.5.2 Significant PM Practices relating to Cost Performance of the Projects**

The regression analysis in table 4.7 (b) revealed that the model indicating significant PM practices relating to cost performance can explain 58.5%, 80.5% and 97.0% of variation in the quality performance of the projects studied under the 'GETFund', 'Common Fund' and 'SIF' organizations respectively.

Not all the significant PM practices have positive relationship with the cost performance of the projects within the 'GETFund' organization. However all the significant PM practices relating to cost performance of the projects within the 'Common Fund' organization were found to exhibit positive relationship whilst the single significant PM practice occurring within the 'SIF' organization related negatively to cost performance of the respective projects.

All the PM practices significantly relating to cost performance of the respective projects varied from organization to organization.

### **5.5.3 Significant PM Practices relating to Quality Performance of the Projects**

The regression analysis in table 4.7 (c) revealed that the model indicating significant PM practices relating to time performance can explain 84.7%, 76.4% and 89.3% of variation



in the time performance of the projects studied under the 'GETFund', 'Common Fund' and 'SIF' organizations respectively.

Not all the significant PM practices have positive relationship with the quality performance projects within the 'GETFund' and the 'SIF' organizations. However the significant PM practice relating to time performance of the projects within the 'Common Fund' organization exhibited positive relationship with quality performance of the respective projects.

The involvement of client in the process of management of the projects is observed as a common characteristic dominating the PM practices affecting quality performance of the projects within all the organizations.

## **5.6 Summary**

As the objectively measured performance of the projects exhibit significant difference from organization to organization, it is observed that the corresponding significant PM practices affecting the corresponding performance also vary from organization to organization and vice versa.

## **5.7 Recommendations**

### **5.7.1 Specific Recommendations**

- The function of identifying projects through systematic procedures should be encouraged on every individual project. This should not be left in the hands of only the end users of a project. This should be organized into an integrated

function where project financiers and end users as well as project consultants are involved.

- In the competitive selection of consultants for a contract or group of contracts, previous working experience with client should always be among factors given high attention.
- Giving advance mobilization to contractors is said to motivate them to execute satisfactory work and this should therefore be possibly practiced on every project.
- In order to minimize delay in the honoring of payment certificates after they have been issued, the number of persons involved in the process of checking and endorsing them should be reduced; only those who would be held responsible in the event of wrong payment should be involved.
- Contractors should always confirm verbal instructions, whether given by the consultant or client's team members, before the execution.
- A linkage between organizations' regional/district/local client's offices and national head offices should be emphasized and always made to function in order to facilitate effective monitoring of projects.
- The practice of valuation of works for payment at defined stages of the project should be, as much as possible, carried out by project managers and this, is believed, will always urge contractors to work at an increased pace.

### 5.7.2 Recommendation for Further Studies

- For further studies, it is recommended that more performance metrics recently developed in other research works (like: benefit to end users, benefit to national infrastructure etc.) be included for measurement. With this, the projects should not necessarily be organization-based. This should lead to the development of a predictive model for determining PM practices that promote increased project performance as well as those that contribute to poor project performance.



## APPENDICES

### APPENDIX I - THE PM PRACTICES AS INDEPENDENT VARIABLES

ACTIVITY	VARIABLE	PROJECT MANAGEMENT PRACTICES	POINTS INDICATING LEVEL OF EFFECT OF PM PRACTICE ON OVERALL PERFORMANCE				
			1	2	3	4	5
			Not significant	Slightly Significant	Moderately Significant	Very Significant	Exceedingly Significant
Identification of Projects before execution	x1	End users themselves being allowed to identify the project					
	x2	The project being determined in line with government's annual development plan					
	x3	Project being identified through collaboration of client's project officers and project end users					
	x4	Determining the project to be executed based on political considerations					
Selecting Project Consultant	x5	Selecting project consultant by direct appointment (i. e, not competitively)					
	x6	Selecting project consultants competitively					
	x7	Basing consultant to be selected on project financial size					
	x8	Selecting consultant largely based on previous working experience with client					
	x9	Basing consultant selection on project's specialization requirements					
Preparing bids for invitation	x10	Consultant preparing the bid under given time period by client					
	x11	Basing time for preparation of bid on completion of design					
Selecting Project Staff	x12	Appointing staff for the project based on educational qualification and experience					
	x13	Choosing staff for projects based on specialization demands of project					
	x14	Selecting managers/coordinators for the project based on integrity and leadership qualities					
Financing of	x15	Bearing entire cost of project through combination of project funds and project end users contributions					

	x16	Bearing entire project cost with project funds only					
	x17	Bearing entire cost of project with funds provided by project end users only					
Awarding of Contract	x18	Assessing and awarding of contract by merit point system					
	x19	Awarding of contract mainly based on tender price submitted by contractor					
	x20	Awarding of contract largely based on consultant's pre-determined time and cost estimate of project					
	x21	Setting award price of contract based on client's pre-determined budget					
Selecting Contractor	x22	Selecting the contractor on open competitive basis					
	x23	Selecting the contractor through pre-qualification based on previous working experience with client					
	x24	The contractor being selected on negotiated contract basis					
Pre-financing construction work	x25	Client providing advance mobilization to pre-finance from project fund to contractor					
	x26	Client having no advance mobilization facility; (i. e. contractor being expected to pre-finance)					
	x27	End users of project taking up part or whole of cost of mobilization					
Monitoring progress of works	x28	Monitoring progress of works solely by consultant's routine visits					
	x29	Monitoring progress of works with occasional involvement of client's project team					
	x30	Client and consultant jointly inspecting works on all occasions of site visit to monitor progress					
	x31	Carrying out progress site meetings only in response to peculiar problems at site					
	x32	Monitoring progress to follow works programme irrespective of irregularity in payment to consultant					
instructions and variation	x32	Ordering work variations only through written instructions from consultant					
	x34	Ordering variations by means of verbal and written instructions from consultant					

Obtaining Project funds for payment	x35	Client project team giving site instructions without knowledge of project consultant					
	x36	All site instructions given verbally by consultant					
	x37	Client obtaining project funds on annual basis					
	x38	Client obtaining project funds on quarterly basis					
	x39	Client obtaining project funds from established budget as and when needed					
Payment to contractor	x40	Procedure for payment involving both client team members and consultant					
	x41	Procedure for payment involving only client's team members					
Interim valuing of works	x42	Consultant carrying out every interim valuation on behalf of contractor after application for interim payment certificate					
	x43	Contractor first preparing claims for every interim valuation for subsequent vetting of consultant					
	x44	Some interim valuations being carried out entirely by consultant on behalf of contractor and some being vetted after contractor has prepared					
Carrying out site instructions	x45	Contractor confirming all instructions, verbal or written before executing					
	x46	Considering consent of client before carrying out any variation					
	x47	Contractor confirming only verbal instructions before carrying out					
	x48	Contractor carrying out consultant's instructions immediately they are issued					
	x49	Contractor carrying out instruction from client's project team without confirming from consultant					



**APPENDIX II - PERFORMANCE INDICES AND POINTS INDICATING PM PRACTICE EFFECT OBTAINED PROJECT  
BY PROJECT FOR REGRESSION ANALYSIS**

		(a) Projects obtained within the 'GETFund' Organization																							
Variables		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Y1	Dependent	0.6	0.5	0.6	0.5	0.5	1.0	0.6	0.8	0.5	0.8	0.5	0.5	0.6	0.5	0.6	0.5	0.6	0.5	1.0	0.5	0.5	0.5	0.6	0.5
Y2		0.7	0.6	0.7	1.0	0.7	1.0	0.8	0.7	0.7	0.7	0.6	0.7	0.6	0.8	0.7	0.7	0.6	1.0	0.6	0.7	0.7	0.7	0.7	0.7
Y3		1.0	1.2	1.0	1.0	1.0	1.2	1.1	1.1	1.0	1.1	1.2	1.2	1.0	1.2	1.1	1.2	1.0	1.2	1.2	1.2	1.0	1.2	1.0	1.0
X1	Independent		3		1	5	4	3	3	5	3	2	3		3	3	2		3	4	3	5	2		5
X2			1		5	5	5	4	4	5	4	3	1		1	4	3		1	5	1	5	3		5
X3		1	3	1	1	5	1	1	3	5	3	4	3	1	3	1	4	1	3	1	3	5	4	1	5
X4			1		4	2	1	1	1	2	1	5	1		1	1	5		1	1	1	2	5		2
X5			1		4	5	5	3	1	5	1	2	1		1	3	2		1	5	1	5	2		5
X6		4	1	4	4	3	1	4	5	3	5	4	1	4	1	4	4	4	1	1	1	3	4	4	5
X7		.	1		4	4	1	2	4	4	4	2	1		1	2	2		1	1	1	4	2		4
X8		.	2		4	4	5	4	4	4	4	1	2		2	4	1		2	5	2	4	1		4
X9		.	1		2	2	3	2	3	2	3	1	1		1	2	1		1	3	1	2	1		2
X10		3	3	3	4	4	3	3	4	4	4	4	3	3	3	3	4	3	3	3	3	4	4	3	4
X11		.	3		4	5	3	3	3	5	3	2	3		3	3	2		3	3	3	5	2		5
X12		4	2	4	4	4	1	3	5	4	5	5	2	4	2	3	5	4	2	1	2	4	5	4	4
X13		.	2		4	2	1	2	1	2	1	4	2		2	2	4		2	1	2	2	4		2
X14		.	1		4	3	1		1	3	1	1	1		1		1		1	1	1	3	1		3
X15		.	1		1	3	1	2	1	3	1	1	1		1	2	1		1	1	1	3	1		3
X16		5	4	5	4	3	5	3	5	3	5	3	4	5	4	3	3	5	4	5	4	3	3	5	3
X17		.	1		1	1	1	1	2	1	2	1	1		1	1	1		1	1	1	1	1		1
X18		.	3		3	1	5	2	3	1	3	5	3		3	2	5		3	5	3	1	5		1
X19		.	4		4	5	5	3	3	5	3	3	4		4	3	3		4	5	4	5	3		5
X20		.	4		4	3	5	3	4	3	4	1	4		4	3	1		4	5	4	3	4		3
X21		4	1	4	2	2	2	3	3	2	3	1	1	4	1	3	1	4	1	5	1	2	1	4	2
X22		.	5		1	5	2	4	4	5	4	3	5		5	4	3		5	2	5	5	3		5
X23		4	1	4	4	4	5	4	3	4	3	5	1	4	1	4	5	4	1	5	4	1	5	4	4
X24		.	1		4	3	1	1	3	3	3	1	1		1	2	1		1	2	1	3	1		3
X25		1	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

		Projects obtained within the 'GETFund' Organization (cont'd)																							
Variables		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
X26	Independent	5	4	5	3	5	2	4	4	5	4	5	4	5	4	4	5	5	4	2	4	5	5	5	5
X27		.	1	.	1	1	1	1	3	1	3	1	1	.	1	1	1	.	1	1	1	1	1	.	1
X28		4	3	4	4	1	5	4	4	1	4	3	3	4	3	4	3	4	3	5	3	1	3	4	1
X29		.	3	.	4	3	5	2	3	3	3	3	3	.	3	2	3	.	3	5	3	3	3	.	3
X30		.	3	.	1	5	2	4	2	5	2	3	3	.	3	4	3	.	3	2	3	5	3	.	5
X31		.	1	.	1	1	3	1	1	1	1	2	1	.	1	1	2	.	1	3	1	1	2	.	1
X32		4	4	4	4	4	1	1	4	4	4	4	4	4	4	1	4	4	4	1	4	4	4	4	4
X33		.	1	.	4	5	5	2	4	5	4	4	1	.	1	2	4	.	1	5	1	5	4	.	5
X34		.	1	.	2	1	2	2	3	1	3	2	1	.	1	2	2	.	1	2	1	1	2	.	1
X35		.	1	.	4	2	2	1	1	2	1	3	1	.	1	1	3	.	1	2	1	2	3	.	2
X36		.	1	.	4	5	1	1	1	5	1	1	1	.	1	1	1	.	1	1	1	5	1	.	5
X37		5	5	5	4	3	5	4	3	3	3	4	5	5	5	4	4	5	5	5	5	3	4	5	3
X38		.	1	.	4	3	1	1	1	3	1	.	1	.	1	1	.	.	1	1	1	3	.	.	3
X39		.	1	.	3	5	5	1	3	5	3	4	1	.	1	1	4	.	1	5	1	5	4	.	5
X40		4	5	4	4	5	1	4	4	5	4	3	5	4	5	4	3	4	5	1	5	5	3	4	5
X41		.	1	.	4	3	1	1	3	3	3	1	1	.	1	1	1	.	1	1	1	3	1	.	3
X42		.	1	.	1	1	5	2	4	1	4	2	1	.	1	2	2	.	1	5	1	1	2	.	1
X43		3	5	3	4	4	5	4	2	4	2	4	5	3	5	4	4	3	5	5	5	4	4	3	4
X44		.	3	.	1	3	3	2	2	3	2	2	3	.	3	2	2	.	3	3	3	3	2	.	3
X45		4	4	4	4	3	5	2	4	3	4	1	4	4	4	2	1	4	4	5	4	3	1	4	3
X46		.	2	.	1	3	5	3	4	3	4	3	2	.	2	3	3	.	2	5	2	3	3	.	3
X47		.	4	.	4	3	2	4	3	3	3	2	4	.	4	4	2	.	4	2	4	3	2	.	3
X48		.	2	.	4	4	1	4	4	4	4	4	2	.	2	4	4	.	2	1	2	4	4	.	4
X49		.	2	.	4	5	2	2	1	5	1	4	2	.	2	2	4	.	2	2	2	5	4	.	5

Variables		(b) Projects obtained within the 'Common Fund' Organization																					
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Y1	Dependent	0.9	0.7	0.6	0.6	0.6	0.9	0.5	0.6	0.7	0.5	0.7	0.6	0.7	0.6	0.5	0.6	1.0	0.6	0.6	0.6	0.6	0.6
Y2		1.0	0.9	1.0	0.9	0.9	1.0	0.9	1.0	0.9	0.9	0.9	1.0	0.9	1.0	0.9	1.0	1.0	0.9	1.0	0.9	1.0	0.9
Y3		1.0	1.0	1.0	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.0	1.1	1.0	1.1
X1	Independent	3	2	3	5	5	3	3	3	2	3	2	3	2	3	3	3	3	5	3	5	3	5
X2		4	2	1	4	4	4	2	1	2	2	2	1	2	1	2	1	3	4	1	4	1	4
X3		4	4	3	1	1	4	4	3	4	4	4	3	4	3	4	3	5	1	3	1	3	1
X4		1	1	1	1	1	1	2	1	1	2	1	1	1	1	2	1	2	1	1	1	1	1
X5		1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	5	2	1	2	1	2
X6		3	4	2	5	5	3	5	2	4	5	4	2	4	2	5	2	1	5	2	5	2	5
X7		4	4	4	3	3	4	1	4	4	1	4	4	4	4	1	4	1	3	4	3	4	3
X8		4	3	3	5	5	4	3	3	3	3	3	3	3	3	3	3	3	5	3	5	3	5
X9		4	2	1	5	5	4	2	1	2	2	2	1	2	1	2	1	3	5	1	5	1	5
X10		4	4	5	3	3	4	5	5	4	5	4	5	4	5	5	5	2	3	5	3	5	3
X11		2	1	1	3	3	2	2	1	1	2	1	1	1	1	2	1	1	3	1	3	1	3
X12		4	4	1	5	5	4	4	1	4	4	4	1	4	1	4	1	4	5	1	5	1	5
X13		5	3	5	5	5	5	2	5	3	2	3	5	3	5	2	5	4	5	5	5	5	5
X14		4	2	5	2	2	4	2	5	2	2	2	5	2	5	2	5	2	2	5	2	5	2
X15		1	2	1	2	2	1	2	1	2	2	2	1	2	1	2	1	1	2	1	2	1	2
X16		4	4	4	4	4	4	5	4	4	5	4	4	4	4	5	4	5	4	4	4	4	4
X17		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
X18		3	3	1	5	5	3	1	1	3	1	3	1	3	1	1	1	5	5	1	5	1	5
X19		3	1	3	1	1	3	4	3	1	4	1	3	1	3	4	3	2	1	3	1	3	1
X20		4	1	4	4	4	4	3	4	1	3	1	4	1	4	3	4	2	4	4	4	4	4
X21		4	3	1	4	4	4	5	1	3	5	3	1	3	1	5	1	2	4	1	4	1	4
X22		3	4	3	5	5	3	1	3	4	1	4	3	4	3	1	3	5	5	3	5	3	5
X23		4	1	4	5	5	4	2	4	1	2	1	4	1	4	2	4	1	5	4	5	4	5
X24		2	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
X25		4	4	3	5	5	4	4	3	4	4	4	3	4	3	4	3	5	5	3	5	3	5

		Projects obtained within the 'Common Fund' Organization (cont'd)																					
Variables		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
X26	Independent	2	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
X27		1	2	1	1	1	1	1	1	2	1	2	1	2	1	1	1	1	1	1	1	1	1
X28		1	2	5	5	5	1	5	5	2	5	2	5	2	5	5	5	5	5	5	5	5	5
X29		4	4	4	5	5	4	2	4	4	2	4	4	4	4	2	4	4	5	4	5	4	5
X30		3	2	3	5	5	3	5	3	2	5	2	3	2	3	5	3	2	5	3	5	3	5
X31		1	2	1	1	1	1	2	1	2	2	2	1	2	1	2	1	5	1	1	1	1	1
X32		4	3	4	2	2	4	2	4	3	2	3	4	3	4	2	4	1	2	4	2	4	2
X33		4	3	4	4	4	4	5	4	3	5	3	4	3	4	5	4	2	4	4	4	4	4
X34		2	3	3	4	4	2	4	3	3	4	3	3	3	3	4	3	5	4	3	4	3	4
X35		1	2	5	1	1	1	1	5	2	1	2	5	2	5	1	5	2	1	5	1	5	1
X36		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
X37		1	1	3	2	2	1	1	3	1	1	1	3	1	3	1	3	1	2	3	2	3	2
X38		3	4	4	4	4	3	5	4	4	5	4	4	4	4	5	4	5	4	4	4	4	4
X39		1	1	3	2	2	1	2	3	1	2	1	3	1	3	2	3	4	2	3	2	3	2
X40		4	2	1	2	2	4	5	1	2	5	2	1	2	1	5	1	1	2	1	2	1	2
X41		1	4	5	1	1	1	1	5	4	1	4	5	4	5	1	5	5	1	5	1	5	1
X42		1	4	3	5	5	1	4	3	4	4	4	3	4	3	4	3	4	5	3	5	3	5
X43		4	2	1	1	1	4	2	1	2	2	2	1	2	1	2	1	3	1	1	1	1	1
X44		2	1	1	1	1	2	2	1	1	2	1	1	1	1	2	1	5	1	1	1	1	1
X45		4	2	2	5	5	4	5	2	2	5	2	2	2	2	5	2	1	5	2	5	2	5
X46		1	4	1	.	.	1	2	1	4	2	4	1	4	1	2	1	2	.	1	.	1	.
X47		4	2	1	2	2	4	5	1	2	5	2	1	2	1	5	1	2	2	1	2	1	2
X48		4	3	4	4	4	4	2	4	3	2	3	4	3	4	2	4	5	4	4	4	4	4
X49		1	4	1	5	5	1	1	1	4	1	4	1	4	1	1	1	3	5	1	5	1	5

		(c) Projects obtained within the 'SIF' Organization																			
Variables		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Y1	Dependent	0.8	0.7	0.7	1.0	0.7	1.0	0.7	0.7	0.8	0.7	0.7	1.0	0.7	1.0	0.8	0.8	0.8	0.8	1.0	0.8
Y2		0.9	0.9	1.0	1.1	1.0	1.1	1.0	1.0	0.9	1.0	1.0	1.1	1.0	1.1	0.9	0.9	1.0	1.0	1.1	0.9
Y3		0.9	0.9	0.9	1.1	0.9	1.1	0.9	0.9	1.5	0.9	0.9	1.1	0.9	1.1	1.5	1.5	1.0	1.0	1.1	0.9
X1	Independent	4	2	4	3	4	3	4	4	4	4	4	3	4	3	4	4	.	.	3	4
X2		2	3	4	3	4	3	4	4	4	4	4	3	4	3	4	4	.	.	3	2
X3		5	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
X4		1	4	2	2	2	2	2	2	5	2	2	2	2	2	5	5	.	.	2	1
X5		.	1	1	1	1	1	1	1	2	1	1	1	1	1	2	2	.	.	1	.
X6		.	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	.
X7		.	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	.	.	2	.
X8		4	4	2	5	2	5	2	2	4	2	2	5	2	5	4	4	4	4	5	4
X9		4	4	4	3	4	3	4	4	4	4	4	3	4	3	4	4	.	.	3	4
X10		3	3	2	4	2	4	2	2	5	2	2	4	2	4	5	5	.	.	4	3
X11		5	1	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	3	4	5
X12		3	4	5	3	5	3	5	5	3	5	5	3	5	3	3	3	.	.	3	3
X13		5	4	4	5	4	5	4	4	4	4	4	5	4	5	4	4	.	.	5	5
X14		4	2	4	2	4	2	4	4	2	4	4	2	4	2	2	2	3	3	2	4
X15		3	5	3	5	3	5	3	3	5	3	3	5	3	5	5	5	5	5	5	3
X16		2	2	2	4	2	4	2	2	5	2	2	4	2	4	5	5	.	.	4	2
X17		1	2	1	3	1	3	1	1	2	1	1	3	1	3	2	2	.	.	3	1
X18		4	3	4	2	4	2	4	4	2	4	4	2	4	2	2	2	1	1	2	4
X19		4	4	1	2	1	2	1	1	1	1	1	2	1	2	1	1	2	2	2	4
X20		3	3	4	5	4	5	4	4	5	4	4	5	4	5	5	5	4	4	5	3
X21		3	5	5	4	5	4	5	5	5	5	5	4	5	4	5	5	4	4	4	3
X22		4	4	5	3	5	3	5	5	3	5	5	3	5	3	3	3	3	3	3	4
X23		5	4	2	5	2	5	2	2	5	2	2	5	2	5	5	5	4	4	5	5
X24		4	1	1	2	1	2	1	1	2	1	1	2	1	2	2	2	1	1	2	4
X25		5	4	4	4	4	4	4	4	5	4	4	4	4	4	5	5	4	4	4	5

		<i>Projects obtained within the 'SIF' Organization (cont'd)</i>																			
<i>Variables</i>		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
X26	Independent	1	.	1	2	1	2	1	1	1	1	1	2	1	2	1	1	.	.	2	1
X27		1	4	1	2	1	2	1	1	3	1	1	2	1	2	3	3	3	3	2	1
X28		5	3	2	3	2	3	2	2	3	2	2	3	2	3	3	3	.	.	3	5
X29		4	2	4	2	4	2	4	4	5	4	4	2	4	2	5	5	.	.	2	4
X30		1	2	5	5	5	5	5	5	3	4	5	5	5	5	3	3	5	5	5	1
X31		1	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	.	.	1	1
X32		3	3	4	4	4	4	4	4	3	4	4	4	4	4	3	3	.	.	4	3
X33		5	4	2	3	2	3	2	2	5	2	2	3	2	3	5	5	.	.	3	5
X34		4	4	5	4	5	4	5	5	1	5	5	4	5	4	1	1	4	4	4	4
X35		4	4	1	2	1	2	1	1	1	1	1	2	1	2	1	1	.	.	2	4
X36		1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1
X37		1	3	1	2	1	2	1	1	2	1	1	2	1	2	2	2	.	.	2	1
X38		1	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	.	.	2	1
X39		5	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	5
X40		1	.	5	4	5	4	5	5	5	5	5	4	5	4	5	5	.	.	4	1
X41		4	.	1	2	1	2	1	1	1	1	1	2	1	2	1	1	4	4	2	4
X42		3	3	4	5	4	5	4	4	1	4	4	5	4	5	1	1	4	4	5	3
X43		2	2	1	2	1	2	1	1	1	1	1	2	1	2	1	1	2	2	2	2
X44		5	2	4	2	4	2	4	4	1	4	4	2	4	2	1	1	2	2	2	5
X45		4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	.	.	5	4
X46		4	4	4	4	4	4	4	4	.	4	4	4	4	4	.	.	4	4	4	4
X47		5	2	1	3	1	3	1	1	1	1	1	3	1	3	1	1	1	1	3	5
X48		1	2	3	1	3	1	3	3	2	3	3	1	3	1	2	2	3	3	1	1
X49		1	4	1	2	1	2	1	1	1	1	1	2	1	2	1	1	2	2	2	1



### **APPENDIX III - QUESTIONNAIRE TO PROJECT COSULTANTS**

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The Research is being carried out as partial fulfillment of the requirements for award of Master of Science Degree in Construction Management. The questionnaire is to enable achievement of the following research objectives:

1. To measure time, cost and quality performance of building projects within an organization
2. To determine the Project Management (PM) practices that significantly affect project performance

*(Please read the notes on the following key concepts, as are applied in the context of this study, before proceeding to the questionnaire herein)*

i) **Project Management (PM) Practices** are how the day-to-day activities and administrative decisions are carried out as functions of all parties (i. e. the consultant, client and contractor) involved in the management of a building project from inception to completion for the purpose of achieving satisfactory project performance.

ii) **Project Performance** is a measure of the extent to which a substantially completed project achieved its Time, Cost and Quality targets as a whole.

iii) **“Your Organization”** refers to the collection of people involved in the management of a building project that is being executed under the Ghana Education Trust Fund GETFund programme.

## SECTION A

1. To which of the following status in your firm do you belong?

(a) Senior staff [    ]    (b) Junior Staff [    ]

2. Before reading this questionnaire, to what extent had you encountered the concepts, Project Management (PM) Practices and Project Performance

(a) Had read and understood concepts deeply [    ]

(b) Had read but understood concepts narrowly [    ]

(c) Had not read but understands concepts from practice [    ]

(3) Within *your organization* why would a PM practice affect the performance of a given building project more significantly than another PM practice would? (*Please tick as many as are applicable*)

(a) Due to ability of PM practice to accelerate achievement of set project objectives [    ]

(b) Due to the consultant's ease of carrying out the PM practice [    ]

(c) Due to consultant and contractor being commonly familiar with the PM practice [    ]

(d) Due to ability of the PM practice to facilitate achievement of client's own goals [    ]

(e) Please state if other reason .....

.....

(4). Could difference in project performance from organization to organization be engendered by PM practices varying from organization to organization?

(a) Yes [   ]    (b) No [   ]

(5) Which of the following would you say makes your organization regard a given PM practice more relevant to project performance whilst a similar organization would regard the same practice less relevant to project performance?

(a) Because of ability of the PM practice to enhance achievement of peculiar organizational goals  
[   ]

(b) My organization being used to applying the PM Practice more frequently than other organizations [   ]

(c) Please state, if other reason .....  
.....  
.....  
.....

(6). Why would you recommend that the PM practice carried out for management of a given project executed within your organization be generally adopted for management of projects of similar nature within other organizations?

(a) Due to ability of practice to contribute to project success [   ]

(b) Due to ease with which practice can be implemented [   ]

(c) Carrying out practice paves way for winning subsequent jobs from client [    ]

(d) The practice accelerates achievement of client's goals [    ]

(e) Please state if other reason

.....

.....

.....

(f) Would not recommend for any practice to be carried out by another organization [    ]

**SECTION B (Performance Information on a Selected Project)**

7) Please select one building project, executed within *your organization*, satisfying the following criteria and provide the subsequent performance information on it

(i) The building project should be education related and substantially completed (i. e. either practically completed, handed over or commissioned)

(ii) Building project should have been substantially completed after year 2002

(iii) Building project should have been executed under traditional procurement method

(iv) Building project should have started as a new construction

### TIME PERFORMANCE OF PROJECT

In the table below, please indicate the time performance of the selected project by ticking its corresponding time performance index obtained. (Alternatively you may provide the figures in the formula below)

Please note that **Time Performance Index** = 
$$\frac{\text{Planned Contract Period} = \dots\dots\dots}{\text{Actual Construction Period} = \dots\dots\dots}$$

<b>Project Completion Status Achieved</b>	Completed behind schedule					Completed on schedule	Completed ahead of schedule				
<b>Index</b>	0.5 and below	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5 and above
<b>Please Tick</b>											

### COST PERFORMANCE OF PROJECT

In the table below, please indicate the cost performance of the selected project by ticking its corresponding cost performance index obtained. (Alternatively you may provide the figures in the formula below)

Please note that **Cost Performance Index** = 
$$\frac{\text{Initial Project Cost} = \dots\dots\dots}{\text{Final Project Cost} = \dots\dots\dots}$$

<b>Project Cost Status Achieved</b>	Completed above initial estimated cost					Completed As estimated	Completed below initial estimated cost				
<b>Index</b>	0.5 and below	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5 and above
<b>Please Tick</b>											

### QUALITY PERFORMANCE OF PROJECT

In the table below, please indicate the quality performance of the selected project by ticking its corresponding quality performance margin obtained.

Please note that quality performance margin is, in your own estimation, the extent to which the quality of the project deviated from what was expected.

<b>Project Quality Status Achieved</b>	Below expectation by about:					As expected	Above expectation by about:				
<b>Margin</b>	50% and below	40%	30%	20%	10%		10%	20%	30%	40%	50% and above
<b>Please Tick</b>											

### SECTION C (Ranking of Significant PM Practices affecting Performance of Project)

8) (a) With reference to the project you have given performance information on, please rank to indicate the significance of the effect that each of the following listed PM practices had on the performance of the project.

(b) Please note the following before ranking:

The PM practice(s) that had significant effect on the performance of the project are those that contributed to the kind of performance achieved at the end of the project either satisfactory or poor. (In other words if project performed poor, what the significant practices that contributed and if project performed satisfactorily, what are the significant practices that contributed to such performance)



ACTIVITY	VARIABLE	PROJECT MANAGEMENT PRACTICES	RANK EFFECT ON PROJECT PERFORMANCE				
			Not significant	Slightly Significant	Moderately Significant	Very Significant	Exceedingly Significant
			1	2	3	4	5
Identification of Projects before execution	x1	End users themselves being allowed to identify the project					
	x2	The project being determined in line with government's annual development plan					
	x3	Project being identified through collaboration of client's project officers and project end users					
	x4	Determining the project to be executed based on political considerations					
Selecting Project Consultant	x5	Selecting project consultant by direct appointment ( i. e, not competitively)					
	x6	Selecting project consultants competitively					
	x7	Basing consultant to be selected on project financial size					
	x8	Selecting consultant largely based on previous working experience with client					
	x9	Basing consultant selection on project's specialization requirements					
Preparing bids for invitation	x10	Consultant preparing the bid under given time period by client					
	x11	Basing time for preparation of bid on completion of design					
Selecting Project Staff	x12	Appointing staff for the project based on educational qualification and experience					
	x13	Choosing staff for projects based on specialization demands of project					
	x14	Selecting managers/coordinators for the project based on integrity and leadership qualities					
Entire Financing of project	x15	Bearing entire cost of project through combination of project funds and project end users contributions					
	x16	Bearing entire project cost with project funds only					
	x17	Bearing entire cost of project with funds provided by project end users only					

Awarding of Contract	x18	Assessing and awarding of contract by merit point system					
	x19	Awarding of contract mainly based on tender price submitted by contractor					
	x20	Awarding of contract largely based on consultant's pre-determined time and cost estimate of project					
	x21	Setting award price of contract based on client's pre-determined budget					
Selecting Contractor	x22	Selecting the contractor on open competitive basis					
	x23	Selecting the contractor through pre-qualification based on previous working experience with client					
	x24	The contractor being selected on negotiated contract basis					
Pre-financing construction work	x25	Client providing advance mobilization to pre-finance from project fund to contractor					
	x26	Client having no advance mobilization facility; (i. e. contractor being expected to pre-finance)					
	x27	End users of project taking up part or whole of cost of mobilization					
Monitoring progress of works	x28	Monitoring progress of works solely by consultant's routine visits					
	x29	Monitoring progress of works with occasional involvement of client's project team					
	x30	Client and consultant jointly inspecting works on all occasions of site visit to monitor progress					
	x31	Carrying out progress site meetings only in response to peculiar problems at site					
	x32	Monitoring progress to follow works programme irrespective of irregularity in payment to consultant					
Giving Site instructions and variation orders	x32	Ordering work variations only through written instructions from consultant					
	x34	Ordering variations by means of verbal and written instructions from consultant					
	x35	Client project team giving site instructions without knowledge of project consultant					
	x36	All site instructions given verbally by consultant					

Obtaining Project funds for payment	x37	Client obtaining project funds on annual basis					
	x38	Client obtaining project funds on quarterly basis					
	x39	Client obtaining project funds from established budget as and when needed					
Payment to contractor	x40	Procedure for payment involving both client team members and consultant					
	x41	Procedure for payment involving only client's team members					
Interim valuing of works	x42	Consultant carrying out every interim valuation on behalf of contractor after application for interim payment certificate					
	x43	Contractor first preparing claims for every interim valuation for subsequent vetting of consultant					
	x44	Some interim valuations being carried out entirely by consultant on behalf of contractor and some being vetted after contractor has prepared					
Carrying out site instructions	x45	Contractor confirming all instructions, verbal or written before executing					
	x46	Considering consent of client before carrying out any variation					
	x47	Contractor confirming only verbal instructions before carrying out					
	x48	Contractor carrying out consultant's instructions immediately they are issued					
	x49	Contractor carrying out instruction from client's project team without confirming from consultant					