FACTORS AFFECTING PROJECT COST MANAGEMENT OF LARGE

COMMERCIAL BUILDING PROJECTS IN GHANA

By

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(B.Sc. Mechanical Engineering)

A thesis submitted to the Department of Construction Technology and

Management, Kwame Nkrumah University of Science and Technology, Kumasi in

partial fulfilment of the requirements for the award degree of

MASTER OF SCIENCE IN PROJECT MANAGEMENT

November, 2019

DECLARATION

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which to a substantial extent has been accepted for the award of any other degree or diploma at Kwame Nkrumah University of Science and Technology, Kumasi or any other educational institution, except where due acknowledgment is made in the thesis.

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ABSTRACT

It is not far-fetched that the building construction industry is inextricably intertwined with the competitive positioning of a nation. Unfortunately, however, project cost is affected by diverse factors that often have detrimental effect on the quality, duration and profitability of building construction projects if not efficiently managed. Meanwhile, at the heart of a successful and profitable building construction project is efficient cost, time and quality management. This research work, therefore, sought to analyze the cost management practices of large commercial building projects in Ghana and recommend holistic and efficient project cost management measures to ensure optimal quality, cost efficiency and profitability of building construction projects. Using the Purposive Sampling approach and administering of questionnaires, the research considered the two senior Project Managers and Quantity Surveyors, in addition to 1No. Construction Manager and 1No. Senior Engineer from 7No. construction firms. The Statistical Package for Social Sciences (SPSS) Software and Excel Spreadsheet were used to analyze the survey data, qualified with frequencies, cross-tabulations and graphs. The relative importance index (RII) of project cost management practices and factors affecting project cost management were calculated and ranked. The study revealed that the building construction industry in Ghana is a complex interrelated system of several players with apt academic credentials, profound experience and youthful and exuberant workforce. Project cost management practices of large commercial building construction projects in Ghana are technically limited in scope and not coordinated in real time between and among the stakeholders involved. The major project cost management practices remain unit costing, cash flow forecasting, tender budgeting, elemental costing and planning, financial cost reporting, working budget adjustment, works programming and record keeping. The factors affecting the project cost estimates of large commercial building projects in Ghana emanates from weak internal structures than external factors; including underestimation of project cost, building material price fluctuations, ineffective project planning practices, and poor building design and changes. To rectify this menace, it is advised that building construction firms should adopt and apply the following project cost management strategies and modeling system in order to optimize their cost management efficiencies; identify critical cost centers along the project value chain, set cost performance targets, identify factors that affect project cost centers, assess cost implications on the entire project, diagnose results, recommend solutions and install an enterprise information system.
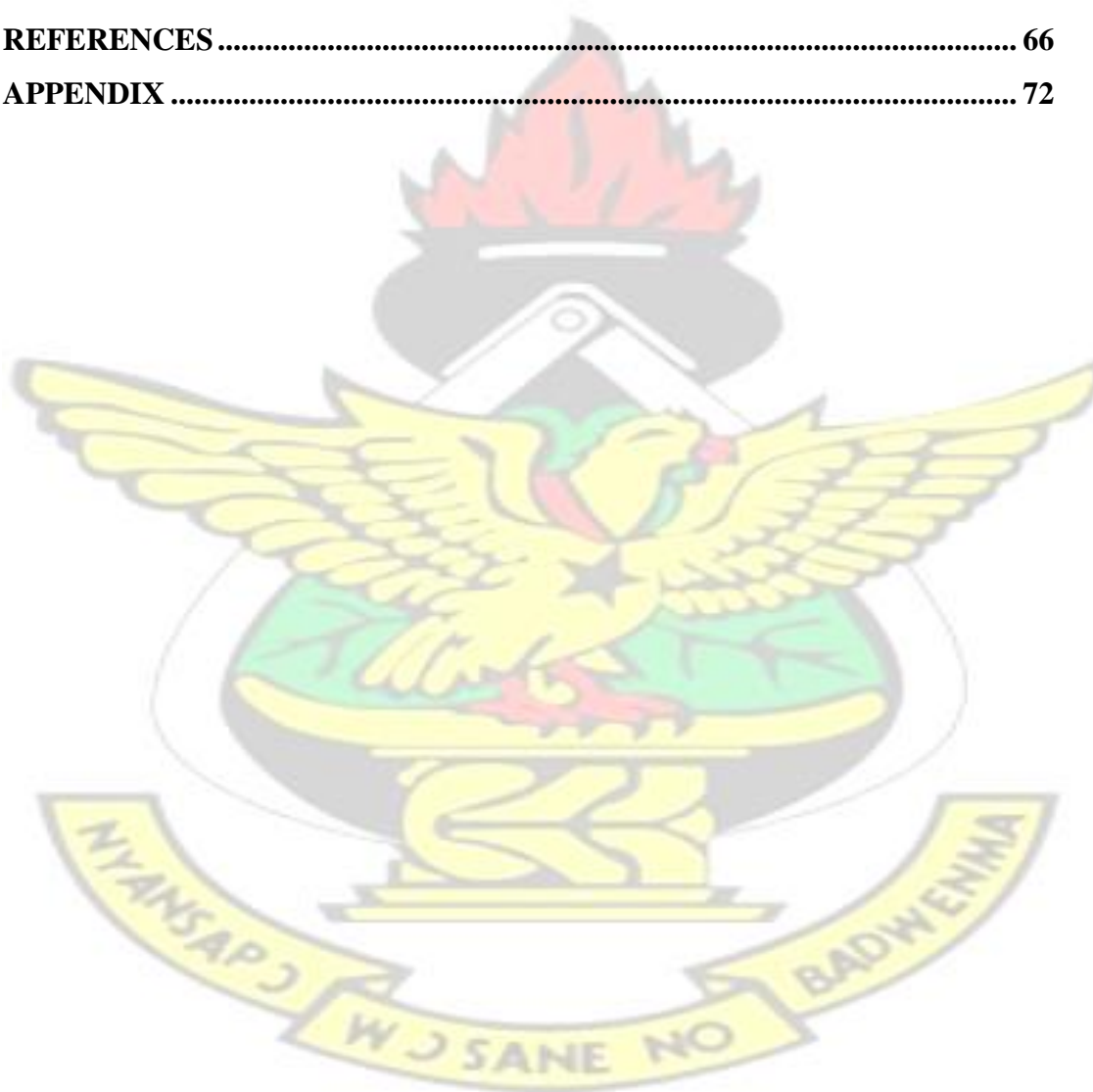

Keywords: Project Cost Management, Commercial Building, Construction Project

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACKNOWLEDGEMENT

All thanks to the Almighty God for His protection and mercies throughout this research work. Undoubtedly, He has been my source of strength and inspiration.

Secondly, I would like to express my profound gratitude to my supervisor Prof. Joshua Ayarkwa of the Department of Construction Technology and Management, K.N.U.S.T, Kumasi for his guidance and direction during this work. I am also grateful to the Teaching Assistants who contributed in diverse ways towards the success of this research work.

I want to thank the built environment professionals who took time off their busy schedules to respond to my request for information and finally, I am grateful to my family and friends for their care, support and prayers throughout my study.
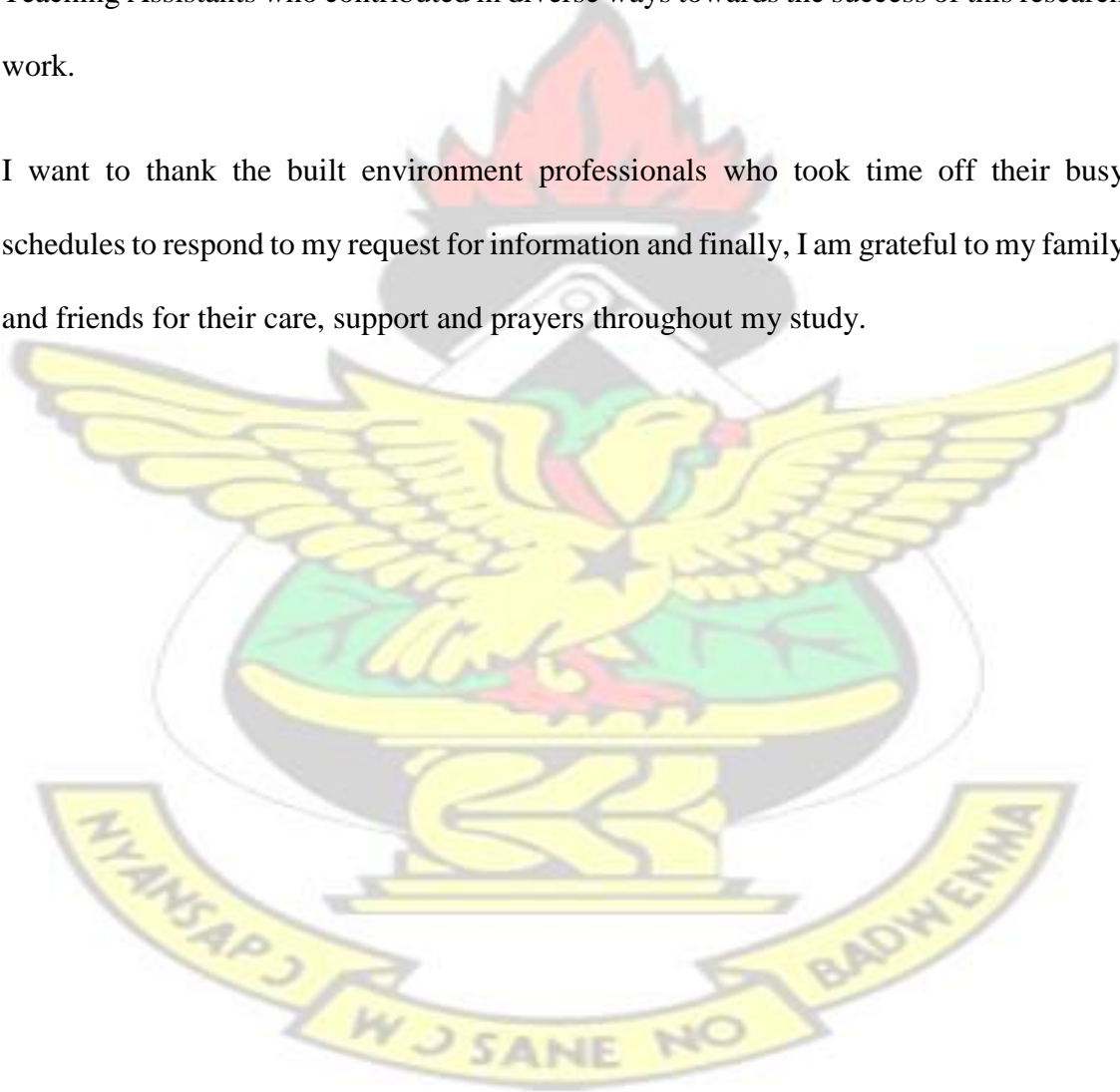
DEDICATION

I dedicate this work to my family and friends.

CHAPTER ONE

GENERAL INTRODUCTION OF PROJECT

1.1 Introduction

It is not far-fetched that the building construction industry is inextricably intertwined with the competitive positioning of a nation. Given contemporary trends of the level of competitiveness and sophistication required of industry players, the industry has steadily outlived its socioeconomic usefulness. The activities of the industry are vital to the achievement of national socio-economic development goals of providing shelter, infrastructure and employment. Although Turkey's economic growth does not commensurate with its construction industry, expansion in the construction sector caused GDP growth over the last five years. More so, the construction industry is a significant economic sector in Turkey which employs 7.4% of the total workforce. Annual construction investment also appreciated from 1998 to 2014 by 80.6% (Erol and Unal, 2015). This was also reflected in the Nigerian construction sector as it expands its capacity to lead the economy of Nigeria (Oladinrin et al., 2012).

The above recent trend coupled with the main processes of the building construction industry makes it a complex system (see Table 1.1). According to Durdyev and Ismail (2012), dynamic and responsive nature of the construction drives economic growth through value-added linkages between construction and other sectors. The industry processes are a repository of many discrete systems and sub-systems of tasks, stakeholders and conflicting objectives. The projects are expensive, inherently technical, time-consuming and must be completed successfully with large and diverse project teams (Ofori, 2015). Conversely, Fernández-Solís (2007) was certain that the building construction as a loosely coupled system exhibits the following characteristics; enormous opportunities of permutations and combinations of complex operations, inefficient

operations, sub-optimization, overlapping activities; and long lead time (Fernández-Solís, 2007).

Meanwhile, at the heart of a successful and profitable building construction project is efficient cost, time and quality management. Azis et al. (2012) consider project cost management as a proactive focus on eliminating non-value added waste whiles keeping within specified budgets. The situation is similar with current planning techniques, where Rolling Wave Planning, for instance, shows changes occur in project cost as a result of slight changes in the various components of the project (Jergeas and Ruwanpura, 2010). Thus, it is crucial for contractors to present cost estimates that renders the project a profitable venture (Miri and Khaksefidi, 2015). Furthermore, effective time management cannot also be overemphasized for projects in the quest to avoid project delay and budget overrun (Ismail et al., 2013).

To ensure optimal cost efficiency and remain competitive therefore, construction firms are continually adopting and implementing project cost management techniques, models and strategies. Unfortunately, however, project cost is affected by diverse factors that often have detrimental effect on the quality, duration and profitability of building construction projects if not efficiently managed, and thus requires meticulous analysis and techniques to manage and control. A survey conducted by Baria et al. (2012) indicated that various factors which are directly related to the construction organizations' responsibilities for managing the cost are influenced by the socio-cultural, economic, technological and political environments within which they operate, Besides, construction project cost control practice is a difficult task that contractors strive to manage efficiently to avoid project losses (Adjei, et al., 2018).

Table 1.1: Leadership and Components of the Construction Industry Development

Component	Potential of Leadership Necessary Action	Leadership Tasks
Technology development	Appropriate research and development to develop locally suitable technologies and faster innovation transfer and diffusion of technology	Strategy formulation (including identification of need) monitoring feedback and review.
Corporate development	Fostering the continuous growth and prosperity of contracting and consulting firms in the construction industry formulating and implementing programmes for developing construction enterprises	Effective corporate leadership including strategy formulation and implementation continuous business development formulation and implementation of national policies monitoring and feedback
Institution building	Building of professional institutions and trade associations, creating umbrellas of these entities to provide a common voice for the construction industry and establishment of a dedicated industry development agency	Leading the institutions to be a force for progress engendering ethics and professionalism strategy and policy formulation for and collective championing of industry development
Materials development	Development of appropriate materials and components with regard to economic environmental social and technical sustainability	Similar to and to be coordinated with technology development
Human resource development	Visionary identification of human resource needs in relevant areas and expertise levels and coordination of programmes to realize the requirements	Effective coordination of the involvement of government industry and academic institutions engendering a spirit of excellence
Documentation procedures and practices and practices	Formulation of appropriate contract documentation with fair and equitable terms adoption of procedures based on good practice rather than history	Collective leadership to develop appropriate documents and procedures for mutual benefit
Operating environment	Development of a conducive operating environment for the construction industry that facilitates the performance of firms and individuals fosters corporate growth and enables the construction industry to play its role in national development	Collective leadership to influence the development of a facilitating environment including education of other sectors about the construction industry and its needs

Source: Ofori (2015).

This research project therefore seeks to analyze the cost management practices of large commercial building projects in Ghana, explore the sensitivity of factors that affect project cost management, and recommend holistic and efficient project cost management measures that ensures optimal quality, cost efficiency and profitability of building construction projects in Ghana.

1.2 Background of Ghana's Construction Industry

Darko and Löwe (2016) provided an in-depth analysis of Ghana's construction sector that is worth reviewing for the purpose of this project. The construction sector is undoubtedly critical to Ghana's economic buoyancy and growth. The sector's GDP contribution increased from 5% to 9% from 1975 to 2000 respectively and catapulted to 15% by 2007 (Sutton and Kpentey, 2012). With about 23,000 duly licensed contractors, the industry requires intensive labour resources and employs a significant proportion of Ghana's workforce (Ministry of Education, 2010). As indicated by the Ghana Living Standards Survey (GLSS), 2% of young people worked in construction close to every week (Darko and Löwe, 2016). Osei (2013) as cited by (Darko and Löwe, 2016) shows that the largest investor and regulator in this industry is the government of Ghana powered by the Ministry of Water Resources, Works and Housing (MWRWH), the Ministry of Education, the Ministry of Transport and the Ministry of Roads and Highways. Their core activities are to facilitate labour and employment processes as well as research, development and vocational training.

The Ministry of Works and Housing fashioned a countrywide Housing Policy Committee in 1986. The Committee's document climaxed in a National Housing Policy and Action Plan for 1987-1990, which looked at improved methodologies for rural and urban shelter. Ghana's Vision 2020 manuscript centered the provision of low cost-housing units

between 1997 and 2000, but this proved unsuccessful due to the lack of funds and political will (Bank of Ghana, 2007; Darko and Löwe, 2016). A modified Housing Policy posted in 2015 targeted on growing non-public area participation in housing construction, maximizing land use and housing functions in the direction of an improved standard of living and infrastructural development (Darko and Löwe 2016). The Ministry of Water Resources, Works and Housing classifies building construction firms in Ghana into financial class D1 to D4 and K1 to K4, where general building contractors are classified as Category 'D' and civil works contractors with category 'K'. large firms often are classed as D1/K1 and D2/K2 whiles small-scale contractors have Class D3/K3 and D3/K4 (Amoah et al., 2011). The criteria for these classifications include the practical and managerial expertise of contractors, their financial standing, general performance, and equipment and plant inventory level (Laryea, 2010).

(Akomah et al., 2010) as cited by (Darko and Löwe, 2016) indicates that Ghana's construction industry is most hazardous, where the number of fatalities, and the wide range of accidents continue to increase. Notwithstanding a number of Acts of Parliament seek to improve the sector's health and safety record, a coherent health and safety policy is still not available.

A traditional Ghanaian building regularly relies on timber and different wooded area products. In typical building structure construction, wood from timber is utilized to make the formwork and support. A noteworthy constraint with this methodology is the failure to either reuse or reuse or recycle after preliminary use. Among the equipment industry practitioners use to layout and examine building performance are building ranking tools. Building rating equipment helps architects and contractors who are concerned about sustainability in the layout and development of buildings, comparable to what blueprints

do for normal buildings. In the development of an ordinary building, the clearer the blueprint is, the closer the constructing will replicate the desired end result (Ahmed et al., 2014).

According to (Atongo, 2014) as cited by (Ahmed et al., 2014), The Ghana Green Building Council (GHGBC) encouraged sustainable construction enterprise with a mission to seriously change the built environment in Ghana in the direction of sustainability via the way our communities are planned, designed, constructed, maintained and operated and as properly supply innovative and excessive best offerings in the design and supervision of tasks in an efficient, timely and comparatively cheap manner to the satisfaction of our clients, the use of a notably encouraged and dedicated body of workers.

1.3 Cost management of large commercial building projects problem statement.

As revealed in the early part of this research project report, project cost management in recent times has become even more critical to sustainable competitive edge in the global building construction industry. The inherent complex and dynamic nature of the building construction industry processes and environments have further compounded the challenge for firms to adopt and implement strategic models and information systems for project cost management, in order to remain cost leaders without compromising on quality, profitability and avoiding other negative environmental externalities. Unfortunately, the combined forces of factors that affect project cost management have outclassed the capacities and expertise of large commercial building construction firms mostly in developing nations relative to that of the developed world, thus they continue to suffer the ramifications of inefficient cost management on the quality outcome of projects, profitability and the socio-economic development of their countries.

6

Adjei et al. (2018) delineated eleven challenges which trouble the international building industry; using out of date methods and concepts, lack of know-how on the use of reachable equipment and technology, overemphasizing on effects while ignoring the cost manage process, lack of challenge value control tactics and systems appropriate to the enterprise, abandonment of complex strategies, lack of consistency in value management by means of managers, serious selection failure, exorbitant marketing expenses, poor attitude towards records conversation technological know-how (ICT) usage, concern in monitoring unique sources of day-to-day value data, versions in contract and lack of economic commitment in tasks (Adjei et al., 2018).

Olawale et al. (2010) identified and discussed major factors affecting project cost management in United Kingdom to include changes in design, incorrect evaluation of projects time and cost, risk and uncertainty related with projects, conflict between project parties, low skilled manpower, financing and payment, unstable interest rate, complexity of works, lack of proper training and experience of project managers and contractors, lack of appropriate software, inflation of prices, contract and specification interpretation disagreement, projects fraud and corruption, and unstable government policies (Olawale et al, 2010). Furthermore, despite the in-depth solution-based project management knowledge in Malaysia, several factors affecting cost variance include ineffective monitoring and controlling techniques, and the complex competency requirements for large projects (Al-Keim, 2017).

In the words of Vaardini (2016) all projects mostly in developing countries, regardless of size, complexity is saddled by targets, uncertainty, and characterized by overruns in cost. The trend is severe in developing countries, where cost overruns sometimes exceed 100% of the estimated project cost. The challenges of Ghana's construction industry like

those of other developing industries are complicated with diverse myriad of causes, impacts and stakeholders. Most projects do not satisfy budgets (cost), schedules (time) and specifications (quality) targets, let alone their maintainability and durability (Ofori, 2012).

In summary, Ghana's construction industry firms and nations across the world are faced with major project cost management challenges, which have had detrimental effects on socio-economic development. However, they lack appropriate project cost management tools and techniques to rectify the menace.

1.4 Research Project Questions

The project generally sought to find answers to the following research questions;

   a) What project cost management practices are being implemented by large commercial building construction firms in Ghana?

   b) What specific factors affect the project cost management of large commercial building projects in Ghana

   c) What project cost management strategies would ensure the cost-effective management of large commercial building projects in Ghana?

1.5 Aim and Objectives of the Research Project

The aim of the study therefore was to analyze the factors which affect project cost management in large commercial building projects in Ghana.

The objectives of the study are:

   a) To identify the project cost management practices of building construction firms in Ghana;

8

b) To identify specific factors that affect project cost management of large commercial building projects in Ghana; and

c) To recommend measures to improve project cost management of large commercial building projects in Ghana.

1.6 Significance of the Research Project

The project recommendations would specifically guide firms and project stakeholders in the global building construction industry and Ghana in particular on implementing cost-efficient measures for large commercial building projects: clients will benefit tremendously by avoiding unnecessary risk through monitoring the cost of their projects. Contractors can use the knowledge to forecast or hedge cost estimates, to avoid the variations in exchange rate and inflation. This project work would further provide relevant data for effective policy formulation for Ghana's construction industry with appropriate resources. Finally, future researchers and academic institutions would also analyze the recommended best project cost management strategies for Ghana's building construction industry and apply and it to other jurisdictions.

1.7 Project Scope and Limitation

The subject matter of this project spans the global building construction industry with specific reference to Ghana. It zooms in to consider the project cost management practices of large commercial building construction firms and related project stakeholders, factors that affect project cost management, their effect on the outcome of large commercial and the way forward for effective cost management.

Major limitations of the project are the limited period for the project survey and report, the consequential relatively small sample size selection, the possibility of falsified project cost data or difficulty in accessing project data for the fear of disclosing trade secrets, and the concealing of critical factors that affect project cost management. Given the dynamic nature of constructions projects and their teams, factors that affect project cost may also vary as such. Thus, a large number of construction firms and the various projects they have undertaken would have generated a more accurate data for thorough analysis. Again, project managers and contractors may only be comfortable with giving hypothetical project cost data mainly because of its sensitive implications for their competitive positioning in the construction industry. This may also affect the generalizability and transferability of the research project.

1.8 Organization of Research Report

The report of this project would be organized as follows; chapter one would be dedicated to providing a background information on the role of the global building construction industry for socio-economic development, the problem of project cost management, the research aim, objectives and questions, the scope and limitations, the originality of the project, ethical considerations for the conduct of the research, definition of key terms in the project, and the structure of project report. Chapter two would entail a literature review with themes including; the global overview, current trends and processes of the building construction industry, the cost management practices of large commercial building projects in the global building construction industry, explore the factors that affect project cost management, assess the impact of cost management practices on the output of building construction projects, and appropriate models, strategies and techniques for cost efficiency in the global building construction industry. Chapter three

outlines the methodology for conducting the research including the research philosophy,

strategy and design. Chapter four would present the analysis of findings of the research.

Discussions, conclusion and recommendations would be finally outlined in chapter five.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction and Research Gap

The volume of research conducted on analyzing building construction project management is impressive and overwhelming. A chunk of these papers, however, have focused significantly on the core processes of building and civil engineering technologies and design, causal factors for project delays, material supply management, project stakeholder management, project quality and profitability, and the causes and challenges of project cost overrun, especially for large construction project in the developed world relative to developing countries. Meanwhile, these projects did not emphasize a project management approach to unraveling the factors that affect the management of large commercial building projects, and the comprehensive control of them. To fill this research gap, this section of the thesis would be dedicated to reviewing relevant literature related to the global overview, current trends and processes of the building construction industry, the cost management practices of large commercial building projects in the global building construction industry, explore the factors that affect project cost management, assess the impact of cost management practices on the output of building construction projects, and appropriate models, strategies and techniques for cost efficiency in the global building construction industry.

2.2 Operationalization of keywords

Key concepts identified in this project include; Project Cost Management, Commercial Building, Construction Project. These terms are defined and explained below to ensure that readers appreciate and understand the perspectives of the research report according to its objectives.

Project Cost Management refers to the steps taken to achieve stipulated budgetary allocations by ensuring optimal cost and time spent on the project (Miri and Khaksefidi, 2015).

Commercial buildings are designed, built, and operated for any use other than residential, manufacturing or agriculture. These buildings are usually dedicated to specific purposes such as for corporate headquarters, to complex multi-purposed facilities such as dormitories (MacDonald, 2000).

Construction project refer to structures that are designed, drawn and erected to meet an idea, and scientific and mathematical instructions towards satisfying it functional, structural and aesthetical specifications (Ugulu and Ikwuogu, 2011).

2.3 Global Overview of the Building Construction Industry

This section provides a broad overview of the building construction industry across the world as presented in previous studies, mainly reviewing current revenue trends, types of the project executed, key players in the industry, management phases and cost centers, and some challenges faced in the industry. This is aimed at providing enough evidence to appreciate the various factors that affect building construction cost management, which has particularly eluded previous studies.

2.3.1 Revenue trends and growth rate

The construction industry comprises a vast part of any country's economy. Studies demonstrate that construction contributes between 5 to 10 percent of Gross Domestic Product (GDP) in all countries, employs up to 10 percentage of the working population, and is accountable for about half of the gross constant capital formation (Ofori, 2012). It

13

is estimated that investment in housing alone is responsible for 2 to 8 percent of Gross National Product (GNP); between 10 and 30 percent of gross capital formation; between 20% and 50% of accumulated wealth; and between 10 and forty percent of household expenditure. Owing to its massive size, the construction enterprise has the capacity to make a contribution directly to the growth of the national economy (Ofori, 2012).

2.3.2 General phases and processes of building construction projects

Characteristically, development tasks are intrinsically special, complicated and time-consuming. The idea of development ventures is reflected in their condition, reason and intended to reflect individual undertakings and references (Munns and Bjeirmi, 1996). The actualization of a normal construction task commences with the consumer conceiving the nature or likely kind of the product he wants. These he articulates in the structure of a quick or user requirement and makes accessible to the design team. The designer interprets these user's requirement into a preliminary design and cost for the client's approval (as depicted in figure 2.1 by Azis et al., 2012). After the approval, the design team then produces tender documents through which tendering processes and procedures are conducted, resulting in the award of a contract to be executed within certain constraints. The contractor proceeds to execute and complete the project according to the contractual requirements.
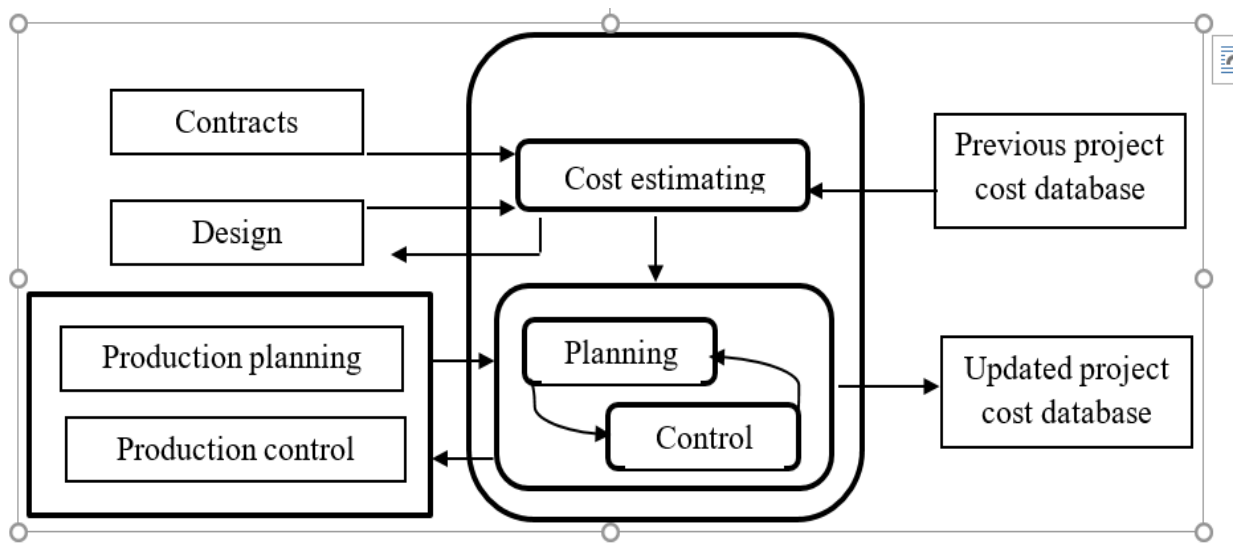
Figure 2.1: Generic Cost Management Process

Source: Azis *et al*. (2012)

2.3.3 Project categories and structure of building construction industry

The structure of the construction industry worldwide portrays a pyramid shape where a few large firms tend to manage a chunk of the market and carry out large projects as against a cluster of small firms which serve a relatively small proportion of the market (Amoah et al., 2011). As presented by Abor and Quartey (2010), the United Nations Industrial Development Organization (UNIDO) draws a clear distinction between construction firms in industrialized and developing countries on the basis of number of employees.

For industrialized countries, large firms have 500 or more workers, medium firms have between 100 and 499 workers and small firms have 99 or fewer number of workers. However, in developing countries, large firms have 100 or more workers whiles medium firms have between 20 and 99 workers. Small firms are firms which have between 5 and 19 workers and micro firms have less than 5 workers (Abor and Quartey, 2010).

Elbeltagi (2009) categorized the building construction industry into four broad spectra of distinct characteristics: Residential Housing Construction consists of houses and high-rise apartments projects that are highly sensitive to changes in general economic conditions, with flexible market entry requirements, highly competitive, and with potentially high risks and high rewards. Institutional and Commercial Building Construction consist of a diversity of project types and sizes, such as schools and universities, hospitals, sports facilities, shopping centers, warehouses and hotels. This category requires specialized project stakeholders with particular related skills such as architects and contractors. Specialized Industrial Construction consists of highly technical projects that apply a series of modern automated technologies. Examples include oil refineries, steel mills and chemical processing plants. Owners of such projects are often comfortable, working with a team of designers, contractors and engineers whose reputation they are sure of. Finally, Infrastructure and Heavy Construction projects include highways, tunnels, bridges, pipelines and drainage systems normally owned by public institutions (Elbeltagi, 2009).

2.4 Project Cost Management

Project Cost Management consists of the processes concerned with planning, estimating, managing, and controlling cost so that the project can be executed approved budget (PMBOK, sixth Edition). Project cost management entails four processes which should be followed to ensure that projects meet the financial constraints imposed on them. These process includes Plan Cost Management, Estimate cost, Determine budget and Control cost. Plan Cost Management is the process of defining how the project costs will be estimated, budgeted, managed, monitored, and controlled. Estimate cost is the process of developing a projection of the monetary resources needed to complete project work.

Determine budget is the process of accumulating the estimated costs of individual activities or work packages to establish an authorized cost baseline. Control cost is the process of monitoring the status of the project to update the project costs and manage changes to the cost baseline (PMBOK, 6th Edition).

2.5 Project Cost Management Practices of Firms in the Building Construction Industry

Cost management practices are a crucial part of building construction projects carried out all over the world. Although building construction firms acknowledge and have testified to the efficiency and effectiveness of newly developed cost management technologies, quite a significant number of them seem to be stacked with existing conventional methods. It is also evident from existing literature that construction firms in the developed world have stepped up efforts to adopt real-time cost monitoring and control technologies and information system along with projects value chain activities and stakeholders, unlike those in the developing world. This trend has been attributed to the lack of skilled personnel coupled with the dynamic and extensive nature of data that is generated over building construction project durations.

In the United Kingdom, project cost management services mostly provided by contractors depicted the pattern of procurement and adherence to the conventional monthly valuations analysis with minimal application of other techniques such as milestone monitoring, variance analysis, s-curves and earned value analysis, as shown in figure 2.2 (Fortune and Grant, 2005). More so, another survey conducted on 250 construction project organizations in relation to cost control techniques and practices indicated a diversified application of software packages along with techniques such as

project cost-value reconciliation, overall profit and loss, at valuation dates, unit costing

and earned value analysis (table 2.1 and 2.2) (Olawale and Sun, 2010).
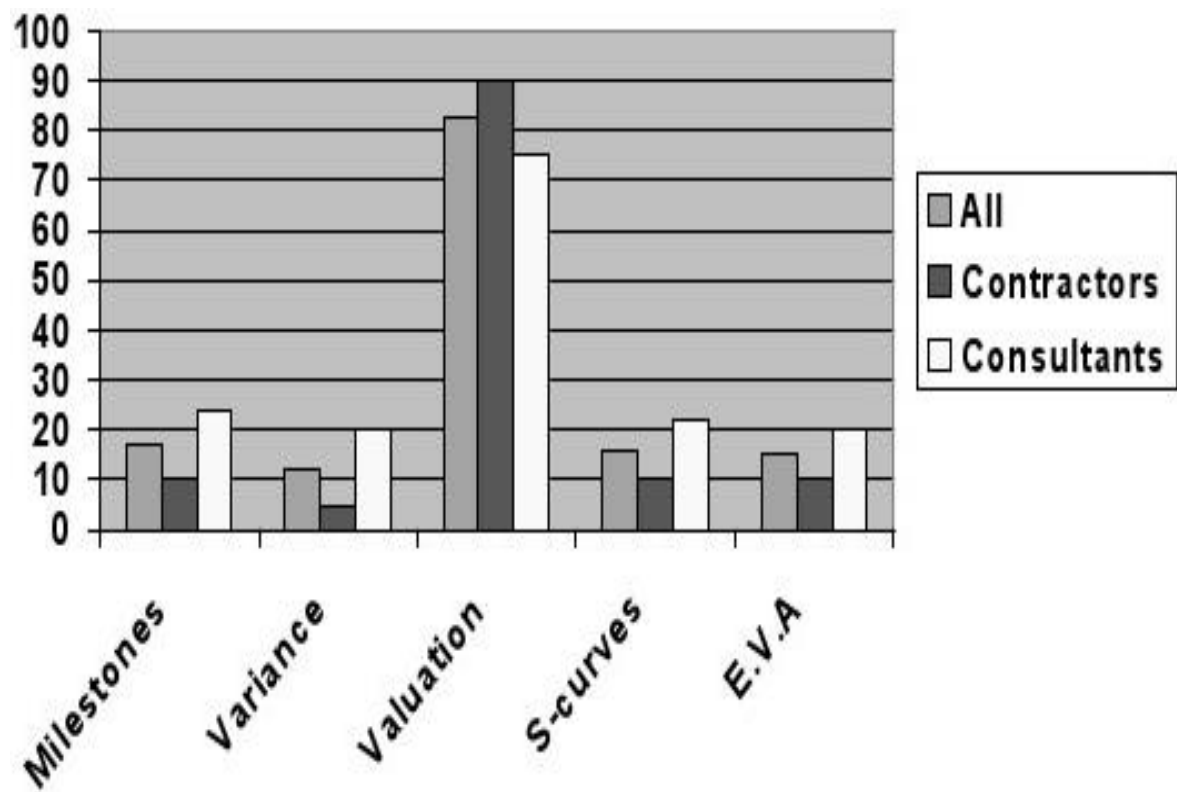
Figure 2.2: Construction Cost Control System in-use in the UK

Source: Fortune and Grant (2005)

Table 2.1: Techniques used for Construction Project Cost Control in the UK

	Contractors	Consultants
Project Cost-Value Reconciliation	22%	20%
Overall profit or Loss	15%	16%
Profit or loss on each contract at valuation dates	17%	10%
Labour/Plant/Material (actual versus forecast reconciliation)	18%	11%
Unit costing	8%	13%
Standard costing	6%	14%
Earned Value analysis	7%	11%
Program Evaluation and Review	7%	4%
Technique (PERT/COST)	-	-
Leading Parameter Method	-	1%

Source: Olawale and Sun (2010)

Table 2.2: Software packages used for Construction Project Cost Control in the UK

	Contractors	Consultants
Bespoke/in-house Systems	29%	38%
Microsoft Project	20%	32%
Project Costing System (PCS)	15%	11%
Asta Power Project	15%	5%
Primavera Sure Trak	8%	5%
Microsoft Excel	7%	3%
COINS	5%	3%
WinQS	-	3%

Source: Olawale and Sun (2010)

Per the survey conducted by Azis et al. (2012) on the various techniques adopted in construction projects by Malaysian building construction firms and their effectiveness, it was revealed that the level of application of cost management was very low. According to the research, the most effective techniques of cost management are Cash Flow Forecasting with RII = 0.79, Tender Budgeting/Estimating and Elemental Cost Plan with RII = 0.77. However, value management and cost code system methods of cost management were not given significant attention (see table 2.3).

Table 2.3: Cost Management Techniques applied by Construction Firms in Malaysia

Cost Management Technique	RII	Rank
Cash flow forecasting	0.79	1
Tender Budgeting/Estimating	0.77	2
Elemental Cost Plan	0.77	2
Financial Report and Cost Report	0.76	3
By Judgment	0.75	4
Value Management	0.74	5
Cost Code System	0.72	6
Working Budgeting/On-going Job Budgeting	0.65	7

Source: Azis *et al.* (2012)

El Sawalhi and Enshassi (2004) analyzed construction cost management practices from a stakeholder management perspective in the Gaza Strip, considering how project owners and contractors perceived and implemented cost control techniques. Whiles analogous estimating was okay with project owners, contractors preferred detailed cost estimating practices such as cash flow and earned value management. Generally, however, project cost management tools for analyzing and controlling construction cost are not satisfactorily the mainstay of the industry. (El Sawalhi and Enshassi, 2004).

Table 2.4: Cost Control Techniques Ranking by Owners and Contractors in Gaza Strip

Group	Tools & Techniques	Owners		Contractors	
		Index	Rank	Index	Rank
Cost estimate and control tools and techniques	Analogous estimating	81.50	1	35.50	5
	Detailed estimating	65.20	2	86.17	1
	Cash flow	65.20	3	60.00	2
	Parametric estimating	59.37	4	38.50	4
	Earned value	53.07	5	30.00	6
	Cost variance analysis	50.00	6	57.73	3
	Best guess estimating	31.83	7	21.70	7

Source: El Sawalhi and Enshassi (2004)

The conventional construction cost management techniques and practices in Africa are not far-fetched. Construction firms in Kampala, Uganda, were identified with the following cost management practices; schedules, site inspection, the project budget, meetings, cost and work progress records and reports, monitoring work and cost performance and bills of quantities evaluation (Otim et al., 2006). Meanwhile, a significant number of firms were comfortable with work programmes, with minimal

attention to time and cost targets, as well as the scientific measurement and comparison with industry standards (see table 2.5 and figure 2.2).

Table 2.5: Cost Control Techniques in Building Sites in Kampala

S/No.	Cost Control Techniques in use	Remarks
1	Work Programmes	Contractors used schedules to monitor progress and financial performance. It is a good method since work progress can be measured and related to cost.
2	Inspection of Works	Inspection of works and comparison made with the budget sometimes subject to judgement, hence lacking.
3	The project Budgets	Cost attached to responsibility centres with work targets to be accomplished. It is used in relation to schedules makes it the best tool for cost control.
4	Site Meetings	Meetings held to review the progress of work and compare to the monetary allocations. Good as it provides some motivation to workers and all stake holders are up to date on the performance of work
5	Record Keeping	Documentation of activities carried out to enable early detection of deviations from the set standards.
6	Monitoring Work and Cost Performance	Clients, consultants and the contractors used monitoring tools of schedules, budgets, inspection and feedbacks to keep a watch on the cost performance. With use of the right tools of control, it produces good results.
7	Evaluation of Works Carried Out	Quantification of works and comparing with the costs in the bill of quantities. Inspection was also reportedly used to evaluate works. This helps to ascertain that the progress of work is on the right track.
8	Others	Sites that did not have particular method to use.

Source: Otim *et al. (2006)*
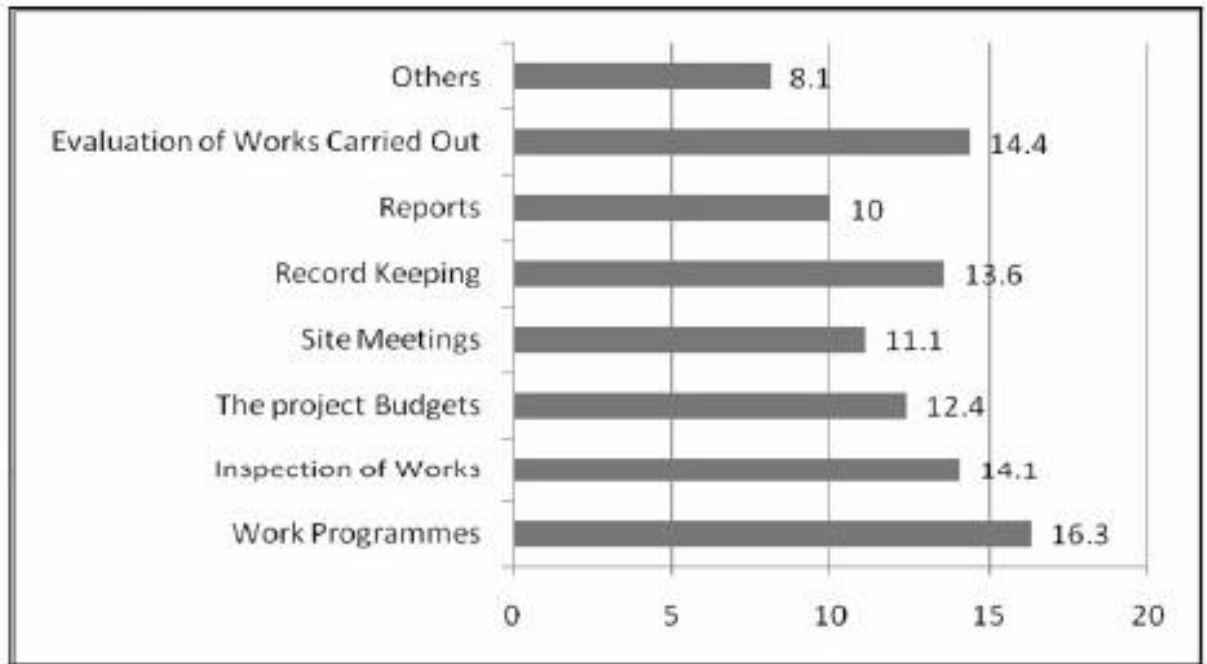
Figure 2.3: Cost Control Techniques in Percentages

Source: Otim *et al*. (2006)

2.6 Factors that Affect Project Cost Management in the Building Construction Industry.

Previous studies have done a great deal of work in examining factors that affect building construction project cost management practices across many jurisdictions across the world. However, most works analyzed these factors from a relatively narrow perspective limited to the main internal project execution stakeholders, with only a few comprehensive works doing otherwise. Enshassi et al. (2009) identified and discussed the major factors influencing building construction project cost to include building materials price and cost fluctuations, project delays, inefficient logistics management, monopolistic power of suppliers, resources constraint, improper cost planning and monitoring during construction stages, unavailability of ready funds, and frequent architectural design changes.

The major cause of cost overrun was inaccurate or errors in the estimation of the original cost (Ali et al. 2010). Some studies also sort to deploy quantitative methodologies to assess the level of significance of the identified factors affecting project cost management (Kasimu, 2012); which revealed that materials price fluctuation, lack of experience in contracts works, insufficient time, and incomplete drawings were significant contributors to project cost management. These factors showed more significant similarities than differences across various countries. Virtually limited consideration is given to analyzing factors that affect cost management along the entire value chain of large commercial building construction projects, especially in developing countries.

A study of factors affecting building construction project cost management in the UK by Jackson (2002), and Olawale and Sun (2010) indicated the following core issues; unplanned design changes, ineffective communication structures, incorrect evaluation of projects time and cost, risk and uncertainty related with projects, non- performance of subcontractors, ineffective conflict management among project stakeholders, price fluctuation and contingencies, delays with financing and payment, inadequate training and experience of project manager and skilled manpower, disagreement in contract documentation, lack of appropriate software, projects fraud and corruption, and unfavorable government policies and regulatory framework (refer to table 2.6 below).

Table 2.6: Ranking of Factors Inhibiting Effective Project Cost Control

Cost control inhibiting factors	Rank	RII
Design changes	1	0.94
Risk and uncertainty associated with projects	2	0.89
Inaccurate evaluation of projects time/duration	3	0.86
Nonperformance of subcontractors and nominated suppliers	4	0.82
Complexity of works	5	0.81
Conflict between project parties	6	0.81
Discrepancies in contract documentation	7	0.80
Contract and specification interpretation disagreement	8	0.80
Inflation of prices	9	0.79
Financing and payment for completed works	10	0.78
Lack of proper training and experience on PM	11	0.77
Low skilled manpower	12	0.69
Unpredictable weather conditions	13	0.68
Dependency on imported materials	14	0.65
Lack of appropriate software	15	0.62
Unstable interest rate	16	0.59
Fluctuation of currency/exchange rate	17	0.58
Week regulation and control	18	0.58
Project fraud and corruption	19	0.55
Unstable government policies	20	0.48

Source: Olawale and Sun (2010)

Memon *et al*. (2010) examined factors that affected the cost management practices of MARA large projects and discovered that cash flow, poor site management and supervision, financial challenges for contractors, inadequate contractor experience, idle laborer attitudes and shortage, incorrect planning and scheduling by contractors were the most critical factors, with strong positive correlations among each other.

Moreover, in Saudi Arabia, the severity index for owners, consultants and contractors aid in unraveling the key factors that influenced construction project cost as including incorrect planning, poor financial control on-site, inexperience in managing contracts and materials cost (Bubshait and Al-Juwairah, 2002). Similarly, Koushki et al. (2005) conducted a personal interview survey of 450 randomly selected private residential project owners and developers in Kuwait and categorized the factors that affected project

cost management into three: contractor's problem, owner's financial constraints, and material-related problems.

Construction firms in the African setting are faced with similar and more challenging factors that often dent their reputation for effective project cost management. Aziz et al. (2012) verified the factors that led to cost variation in the construction of wastewater projects in Egypt. After examining 52 factors in a questionnaire survey, the following factors reaffirmed a higher cost variation in owner initiated projects originated by the contractor: availability of required raw materials, sufficiency of time, cost of design phase, fraudulent prevention, bulk material purchase and the nature goals set by the firms.

Furthermore, factors affecting the cost management practice of construction firms in the southwestern part of Nigeria were also ascertained and better appreciated using research survey approach and the Relative Importance Index (RII) technique for over 300 respondents in the construction industry. It was explicit according to the survey results that the factors affecting cost management are inefficient management and leadership skills, sub-optimal allocation of resources, inefficient waste management on sites, unstructured payment mechanisms, pilfering and embezzlement at sites and variation during construction works (Fagbenle et al., 2018).

In Ghana, the main factors that affect building construction projects are difficulties in the payment of workers, lack of technical know-how by project team members, lack of due diligence in procurement, unqualified contractors and frequent surge of material prices. Project team members also tend to blame each other for non-strategic and uncoordinated management of project cost, where contractors and consultants attributed the problem to the inconsistent payment during project operations, and project owners blame it on poor management by contractors (Frimpong, 2003).

25

2.7 Cost Management Models, techniques, tools and strategies for efficient building construction project cost management.

Models, techniques and strategies to improve project cost management are not lacking, as confirmed in existing literature. However, applying them during large commercial building projects in developing countries is particularly on the low. Cost management strategies suggested by previous works seem to be incompatible with the reality of building construction projects, thus they are cumbersome to implement as compared to conventional methods. Miri and Khaksefidi (2015) explained cost control as encapsulating the identification of changes in the cost of the project, its management and evaluation. Cost control strategies were outlined in 5 steps:

1. Determine the desired cost that project costs are controlled under that base.

2. Calculate the real cost based on the planned project

3. Comparison of the real cost and the cost of the project

4. Analysis of the level, degree of effects and cause of deviations

5. Recommend ways to correct operation

The project management institute (PMI) (2008) also proposed the allocation of joint costs technique for managing construction project cost. This technique is flexible enough to develop a cost function by assigning particular characteristics expenditure items; such as (1) labour, (2) material, (3) construction equipment, (4) construction supervision, and (5) general office overhead, in order to appreciate their dynamics with each other when tested with various values. However, the causal relationship between the allocation factor and the cost item may not be derived in certain circumstances.

Building Information Modelling (BIM) is a relatively new building construction management information system that has been widely acclaimed in the construction industry. With an embedded 4th dimension (4D) time and 5th dimension (5D) cost modeling and cost information data sharing functions, the BIM automates construction processes and allows project cost managers enough time to focus on training and supervising project team members on technical processes (Smith, 2016). A great digital future is envisioned by Mitchell (2012) for project cost management professional in the light of embracing the 5th dimension functionalities in the BIM environment. A further advantage is espoused by Muzvimwe (2011) where cost managers can simulate and explore various design and construction scenarios and disseminate the integrally linked data for the client in real-time. That notwithstanding, Smith (2016) identified a discrepancy where quantity surveyors reported that the model was developed by other project team members and therefore lacks the tailor-made information to allow model-based measurements and quantity take-off, thus disrupting work flow.

Furthermore, Shane et al. (2015) presented a somewhat comprehensive model for analyzing project cost management. The model allows project team members to incorporate the funding flows into the procurement plan using standard project management tools, such as resource-loaded critical path method schedules, earned-value analysis, or cash balance for linked project draw schedules (see figure 2.4).
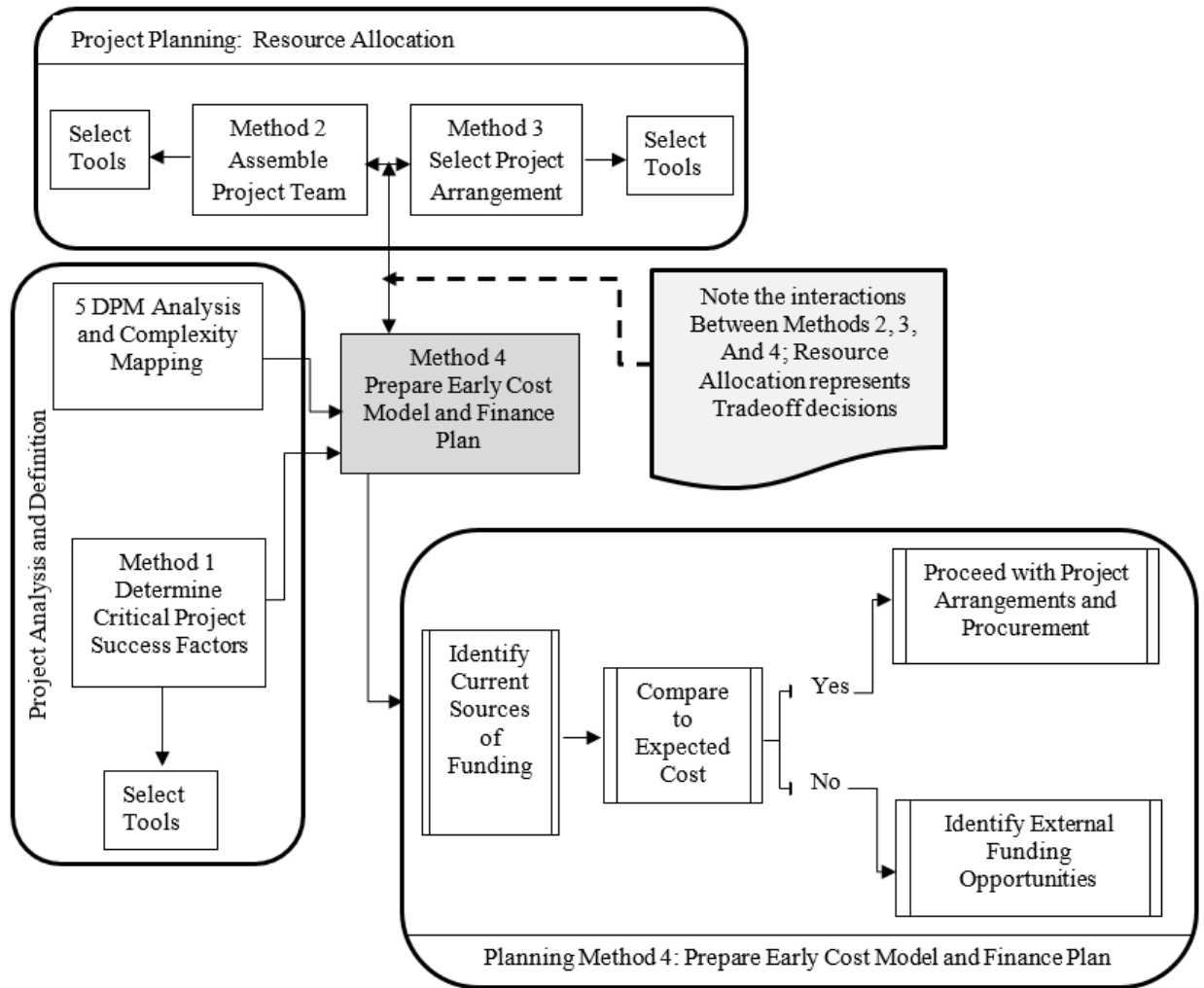
Figure 2.4: Construction Project Cost Preparation and Financial Planning Model

Source: Shane *et al.* (2015)

Another intuitive approach to enhancing project cost management is the value management process (figure 2.5). It was first introduced by General Electric Company (GEC) in the USA. The model generally adopts a systematic and team-based approach to eliminating all construction cost activities that do not add value to the project performance over the project life span (Eldash, 2012). The model further advocates for the need to establish a long-term strategic alliance with project stakeholders at the early stages of the project instead of at later stages, mainly due to the indelible impact on

management decision on project cost performance at late stages of projects (Eldash, 2012). Its core steps include;

1. To determine the functional requirements of the project or any of its constituent parts;

2. To identify the alternatives;

3. To examine the cost and value of each alternative to enable the best value selection.
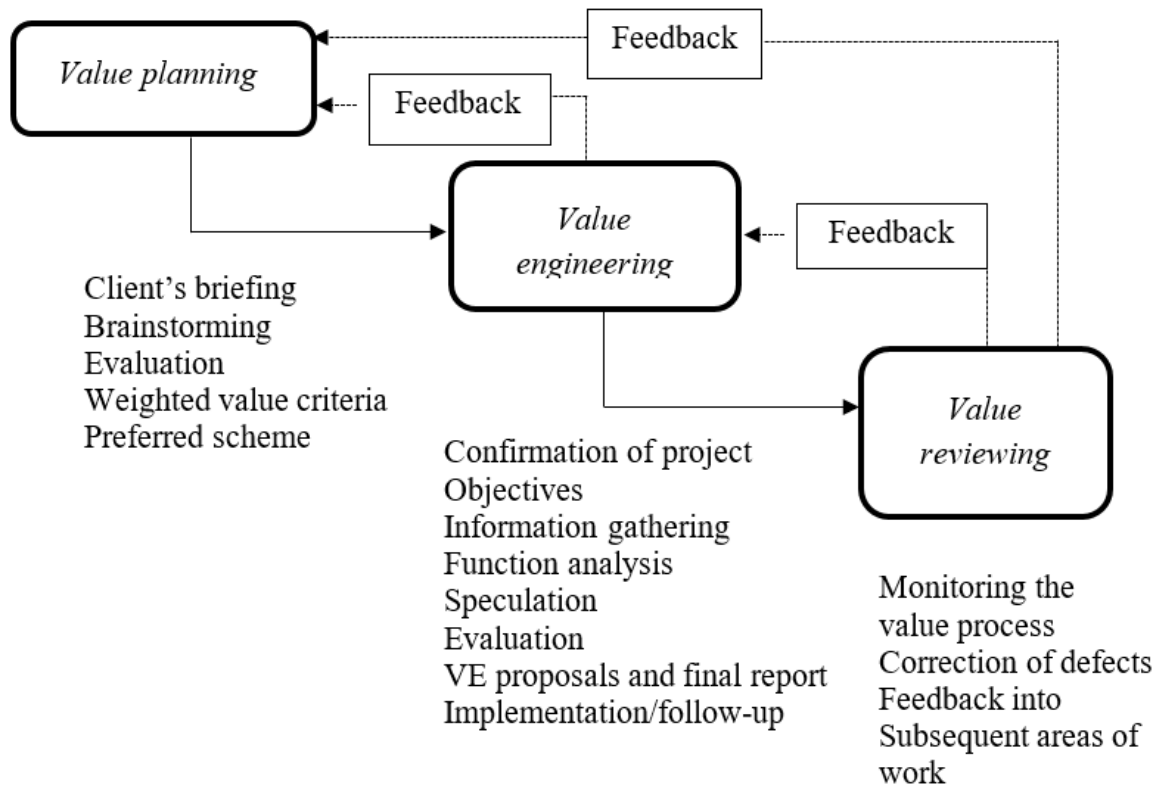
Figure 2.5: The Value Management Process Model

Source: Eldash (2012)
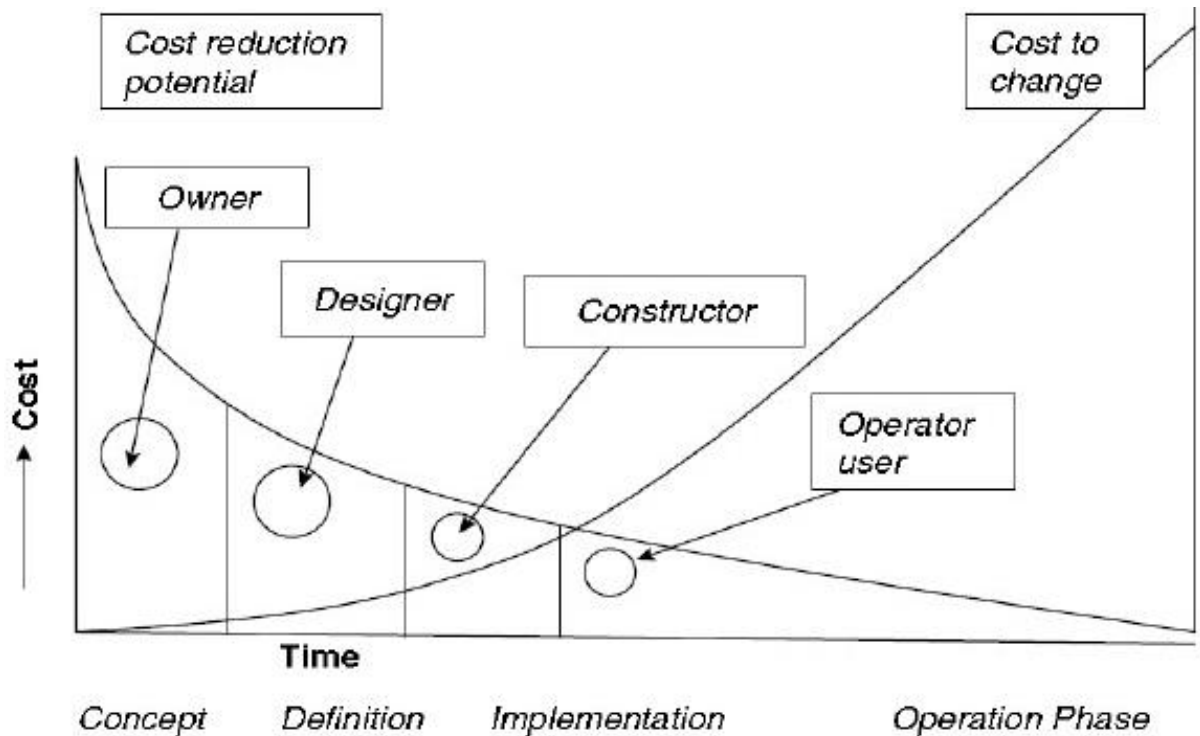
Figure 2.6: Stakeholder Activities and Impact On Project Cost

Source: Eldash (2012)

Other more conventional models and techniques for improving project cost management are the cost-value reconciliation (CVR), contract variance (unit costing) and earned value analysis, as presented in Eldash (2012). According to Howes (2000) as cited in Eldash (2012), Cost-value reconciliation model merges construction cost and value management tools in a manner that reflects the profitability of the firm. However, the model requires some adjustments which are reconciling elements included within costing but not in the external valuation, any adjustments necessary to integrate cost cut-off date and the on-site valuation date, and continual variations in project contract agreements. Contract variance also emphasizes the activity by activity record of cost at various cost centers in order to under real-time corrective steps to avert overall low quality and profitability project outcome. Finally, the earned value management (EVM) is an interconnected

project cost and schedule control system which supports trend analysis, 'S' curves formulation and cost/schedule variances. Three key components of EVM are;

1. The planned value (PV): that portion of the approved cost estimate planned to be spent on the given activity during a given period;

2. The actual cost (AC): the total cost incurred in accomplishing work on the activity in a given period, which should commensurate with the PV and earned value (EV).

3. The earned value (EV): the value of the work actually completed.

2.8 Summary and Conclusion

The volume of research conducted on analyzing building construction project management is impressive and overwhelming, and have focused significantly on the core processes of building and civil engineering technologies and design, causal factors for project delays, material supply management, project stakeholder management, project quality and profitability, and the causes and challenges of project cost overrun, especially for large construction project in the developed world relative to developing countries.

The construction industry contributes significantly to the growth of the national economy, for instance through the creation of vast employment. The structure of the construction industry worldwide portrays a pyramid shape where a few large firms tend to manage a chunk of the market and carry out large projects as against a cluster of small firms who serves a relatively small proportion of the market (Amoah et al., 2011).

Although building construction firms acknowledge and have testified to the efficiency and effectiveness of newly developed cost management technologies, quite a significant number of them seem to be stacked with existing conventional methods. However,

construction firms in the developed world have stepped up efforts to adopt real-time cost monitoring and control technologies and information system along with projects value chain activities and stakeholders, unlike those in the developing world. The major project cost management practices in the industry include variance analysis, s-curves, earned value analysis, Tender Budgeting/Estimating, Elemental Cost Plan, value management, cost code system methods, cost and work progress records and reports, monitoring work and cost performance and bills of quantities evaluation (Olawale and Sun, 2010).

Major factors influencing building construction project cost include building materials price and cost fluctuations, project delays, inefficient logistics management, monopolistic power of suppliers, resources constraint, improper cost planning and monitoring during construction stages, unavailability of ready funds, and frequent architectural design changes. (Enshassi et al., 2009).

Models, techniques and strategies to improve project cost management are not lacking. Notable examples are the Building Information Modelling (BIM), the value management process, and other more conventional models and techniques such as the cost-value reconciliation (CVR), contract variance (unit costing) and earned value analysis. (Smith, 2016).

This research project would, therefore, add to knowledge by applying a project management approach to unraveling the factors that affect the management of large commercial building projects and recommend an appropriate combination of models to guide efficiency.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlines the various methods to be deployed for the data collection and analysis processes for this research project. The reasons for the application of each method selected would be discussed logically and systematically in accordance with the research objectives and questions outlined in sub-sections 1.4 and 1.5 of this research report (Saunders et al., 2009). As cautioned by Kumar (2010), the methodology of a research enquiry must follow a certain logical sequence that is relevant, appropriate and justified.

3.2 Research purpose

The overarching purpose of this study is to analyze the cost management practices of large commercial building projects in Ghana, explore the sensitivity of factors that affect project cost management, and recommend holistic and efficient project cost management measures that ensure optimal quality and profitability.

3.3 Approach of Research

The research would adopt a quantitative research method. A survey was used to collect data and a deductive approach was used to analyze the data. The deductive approach involved applying existing project cost management models and theories to solve the cost management problem of large commercial building projects in Ghana. Deductive research develops theories or hypotheses and then tests out these theories or hypotheses through empirical observation. It is essentially a set of techniques for applying theories in the real world in order to test and assess their validity (Crowther and Lauesen 2017).

Moreover, the research delves into assessing the project cost management practices of large commercial building firms in Ghana's construction industry, identifying factors that affect their cost performance, coupled with statistical inferences and graphical representations. This, therefore, activates both qualitative and quantitative research approaches as well for this project. Qualitative research is an approach for exploring and understanding the meaning of individuals or groups ascribe to a social or human problem. Whiles quantitative research is an approach for testing theories by examining the relationship among variables (Creswell, 2014).

3.4 Research Project Design and Tactics

The research design and tactics typify the operations of the entire project methodology. Other than the proof that the research philosophy and approach directs the research design and tactics, the nature of the research objectives is more critical to designing the conduct of the research project. According to Saunders et al. (2009), the research design concerns the overall plan of the research, whiles research tactics is about finer details of how to gather and analyze specific kinds of information. That which follows is a lucid justification of the decisions made about the research purpose, research strategy, study population and sampling procedures, data sources and collection procedures, and data analysis and presentation tools. Also highlighted is exactly how these procedures generate credible findings for analyzing and answering the research questions.

3.4.1 Research strategy

This research adopts a survey research strategy in order to explore and explain, the diverse factors that affect project cost management across various large commercial building projects carried out by construction firms in Ghana. A survey approach was used

because it is cost-effective, flexible and allows researchers to obtain reliable data for analysis. Explanatory research attempts to clarify why and how there is a relationship between two aspects of a situation or phenomenon whiles exploratory research aims at either exploring an area where little is known or of investigating the possibilities of undertaking a particular research study (Kumar, 2014).

3.4.2 Population and sampling procedure

The whole target group and subject matter of a research project, being its type of people, places, behavior, things or time is the 'population' of the research (Loseke, 2012). The population of this research project is all building construction firms in Ghana. Out of this population, a sample frame was arrived at by gathering information from owners of large commercial buildings located in Accra. From the information gathered, it emerged that 7No. D1K1 construction firms have built the chunk of the large commercial building projects in Accra.

3.4.3 Sampling Procedure

Purposive sampling, which is a form of non-probability/judgmental sampling technique was employed to determine the sample size for this study. These professionals have been selected because of the rich knowledge they possess in the subject matter. Purposive sampling aims at selecting particular subjects that can provide specifically required knowledge by the study (Saunders et al., 2009).

Additionally, according to (Kumar, 2011), the foremost consideration in purposive sampling is the researcher's judgement as to who can provide the best information to achieve the objectives of your study. The researcher only goes to those people who in his opinion are likely to have the required information are willing to share it. This type of

sampling is extremely useful when a researcher wants to describe a phenomenon or develop something about an emerging situation (Kumar, 2011).

3.4.4   Determination of Sample Size

The study is focused on large commercial buildings in Accra. In an article of the Oxford Business Group (2014), the Chartered Institute of Building in Ghana estimated over 1,600

building construction firms operating in Ghana since October. Meanwhile, Oppong (2013) had reported that large and medium Ghanaian construction firms represented about 10% (160 firms) of the total number of construction firms registered with the Ministry of Water Resources, Works and Housing, whiles 90% were small scale construction firms. Further specific surveys showed that one hundred and sixty-three (163) building and civil contractors in the Ashanti Region were categorized and thirteen (approximately 8%) of them have the D1K1 license class, twenty-seven (27) have D2K2 and one hundred and twenty-three (123) hold the D3K3 license class (Asher, 2015) as revealed by the Association of Building and Civil Engineering Contractors. This was recently confirmed by the Ministry of Works and Housing, where the majority (roughly 60 per cent) of constructions firms in Ghana fall within the class 3 category (D3K3), while only about 10 and 20 per cent fall within Class 1 (D1K1) and Class 2 (D2K2) respectively (Owoo and Lambon-Quayefio, 2018).

Out of 21No. high rise commercial buildings which were surveyed in Accra by requesting for information from the building owners/Property Managers, it emerged that a chunk of these large commercial buildings located were constructed by 7No. D1K1 Construction firms. Consequently, the Purposive Sampling approach was applied in

selecting the two most senior Project Managers and Quantity Surveyors, in addition to 1No. Construction Manager and 1No. Senior Engineer from the 7No. Construction firms identified. These make up a total of 5 project stakeholders in each of the 7 No. firms, making up a product of forty-two (42) key project stakeholders in all. The criteria for the selection were targeted at large commercial building project management stakeholders who directly and indirectly influence the cost management decisions, thus whose actions affect the overall cost the projects. Again, large commercial building projects in Ghana are complex in nature and represent a range of stakeholders whose actions have tremendous cost implications (Dadzie et al., 2012). In addition, the period allowed for the conduct of this research was relatively limited and thus a larger sample size would have resulted in huge data collection and tedious analysis that may not be possible within the allowed timeframe.

3.4.5   Data sources and collection procedures

This research project drew from both primary and secondary data to adequately answer the research objectives. Primary data collection was by questionnaires. Questionnaires were administered to key project stakeholders which include Project Managers, Quantity Surveyors Construction Managers and Senior Engineers. Questionnaires are instruments that the respondents complete at their own convenience (Trochim et al., 2015). They contain closed-ended questions that have limited number of answers for participants to select from, and open-ended questions that allow participants to express their best knowledge on the subject matter without the researcher's involvement (Holmes et al., 2011).

The main source of documentary and survey-based secondary data sources for this study was encapsulated written materials such as organizations' notices, financial statements, website, annual and general meeting reports, books, journals, media accounts, magazine articles, newspapers and government publications.

3.4.6 Data analysis and presentation tools

The main instrument used to code and analyze the quantitative data that was derived from questionnaires was the Statistical Package for Social Sciences (SPSS) Software and Excel spreadsheets qualified with frequencies, cross-tabulations and graphs.

Additionally, the relative importance index was also applied to test the sensitivity of the various factors that were derived as influencing project cost management of large commercial buildings, towards identifying the most important of the myriad possible factors to be tested in the project survey. According to Fugar and Agyakwah-Baah (2010), the score for each factor is calculated by summing up the scores given to it by the respondents. The ranks are sorted according to the relative index scores. In this research a 4 Point Likert Scale was used Thus, the relative importance index (RII) is calculated with the formula below;

$$RII = \sum \frac{W}{A \times N} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \, equ \; (1)$$

$$RII = \sum \frac{4n_4 + 3n_3 + 2n_2 + 1n_1}{4 \times N}$$

$$(0 \leq RII \leq 1)$$

Where,

$W = The\ weight\ given\ to\ each\ item\ by\ the\ respondents\ ranging\ from$

$1\ (Not\ important/Effective)\ to\ 4\ (Very\ important/Effective)$

$the\ weight\ given\ to\ each\ factor\ by\ the\ respondents\ which$

is computed by multiplying each frequency by the likert scale factor.

$A = The\ highest\ weight\ (4)$

$N = The\ total\ number\ of\ Respondents$

Moreover, some existing project cost management models and project cost management information systems would be adopted, analyzed and redesigned to rectify cost inefficiencies in project cost management of large commercial building projects in Ghana.

3.5 Ethical Considerations

First of all, all respondents were briefed on the subject matter of the research project before questionnaire administration began. Consequently, their consent was sought before proceeding with the project survey processes. Besides, the anonymity of participants was being kept scared, with no clues to their response as received from the project survey. Besides, sensitive data of projects undertaken by the selected building construction firms were not be revealed in any form especially in the research report.

3.6 Credibility of the Research Project Findings

The literature reviewed to form the empirical and theoretical basis for this research project were taken from credible academic sources and agencies such as journals, books, online articles and white papers. It also adopts existing project management models to analyze cost management flaws in Ghana's construction industry and recommend appropriate solutions. The gaps in existing research were identified in order for this research to add substantially to the existing body of knowledge. The data collection methods, analysis tools, sample size rate adopted for this project is fairly appropriate,

ethical and sufficient to generate generalizable outcomes. Generally, therefore, the project depicts reliability and transferability (Pennink and Jonker, 2010).

CHAPTER FOUR

RESEARCH FINDINGS, ANALYSIS AND DISCUSSIONS

4.1 Introduction

Subjecting research data to statistical analysis and graphical interpretations is a crucial part of deriving vital information as a response to your research objectives and to further guide the formulation of appropriate recommendations for the present and future beneficiaries of the research work (Lancaster, 2007). This consequently eases the difficulty of appreciating the various perspectives of the research (Lynch, 2010). This chapter presents the demographic characteristics of respondents, the thematic study findings related to the project cost management practices of building construction firms on large commercial building projects in Ghana, the factors that affect cost management of large commercial building projects in Ghana, and measures to improve project cost management of large commercial building projects in Ghana. For this analysis, forty-two (42) questionnaires were successfully administered out of a targeted number of forty-two (42) respondents. The response rate achieved is therefore 100%. These findings are complemented by detailed discussions and inferences that further reaffirmed the quantitative data collated for the research report.

4.2 Demographic, Professional and Academic Credentials of Respondents

The building construction industry is generally noted to be dominated by males than females. This survey conducted during this study confirmed the above by indicating that 83.3% of the respondents were males and 16.7% were females (See figure 4.1 and table 4.1). This means males continue to dominate in construction firms which manage large commercial building construction projects in Ghana. With regards to the age range of the key stakeholders identified in this study, 37 respondents who represent 88.1% are

between 31-50 years, whiles 5 respondents who represent 11.9% are 51 years and above. This connotes a youthful and exuberant workforce handling the affairs of large commercial building construction project cost management in Ghana. Please refer to table 4.2 and figure 4.2 for better insight.
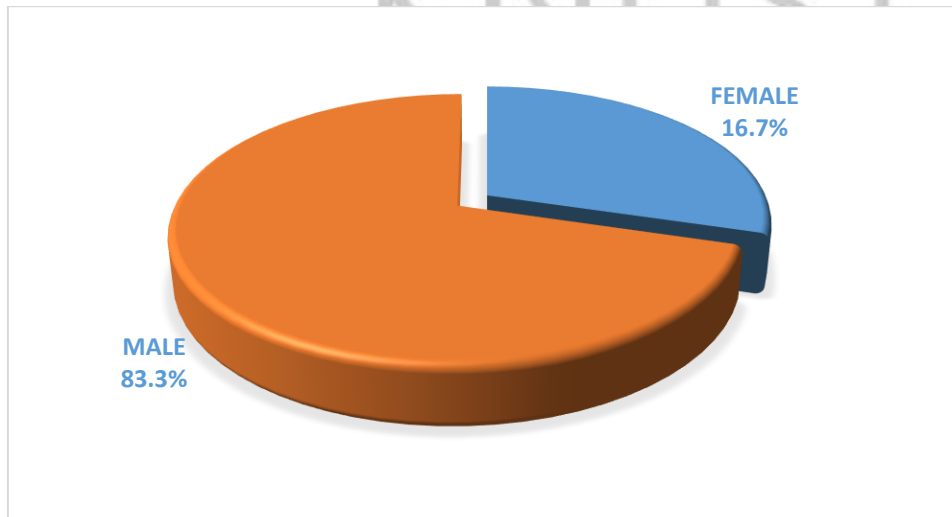
Figure 4.1: Graphical Gender Distribution of Employees in Ghana's Building Construction Industry

Source: Field Survey (2019)

Table 4.1: Gender Distribution of Employees in Ghana's Building Construction Industry

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	35	83.3	83.3	83.3
	Female	7	16.7	16.7	100.0
	Total	42	100.0	100.0	

Source: Field Survey (2019)

Table 4.2: Age Distribution of Employees in Ghana's Building Construction Industry

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	31-50	37	88.1	88.1	88.1
	51 and above	5	11.9	11.9	100.0
	Total	42	100.0	100.0	

Source: Field Survey (2019)
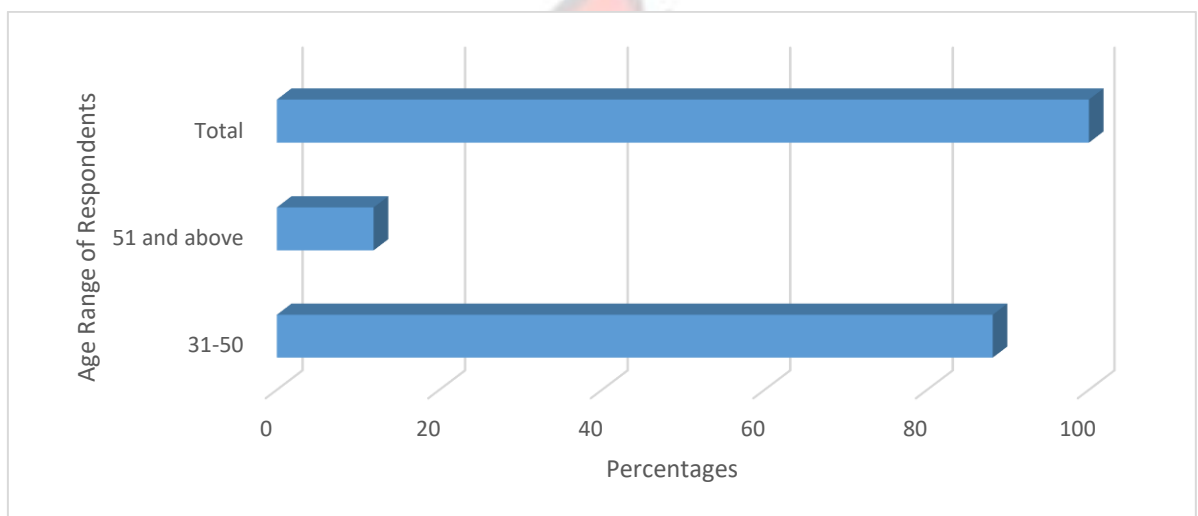
Figure 4.2: Graphical Age Distribution of Employees in Ghana's Building Construction Industry

Source: Field Survey (2019)

In the quest to assess the project cost management efficiency and effectiveness by building construction firms in large commercial building projects in Ghana, the study further investigated the academic credentials and the level of practical experience in the industry. It was revealed that 33 out of the 42 respondents, representing 78.6% were bachelor degree holders in building construction management-related programmes, whiles 21.4% representing 9 respondents were master's degree holders in construction-related fields (table 4.3).

Table 4.3: Academic Credentials of Employees in Ghana's Building Construction Industry

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Masters	9	21.4	21.4	21.4
	Bachelors	33	78.6	78.6	100.0
	Total	42	100.0	100.0	

Source: Field Survey (2019)

Similarly, 47.6% of respondents have served in the industry for 11-15 years whiles 40.5% have served for 6-10 years and only 1.9% had worked in the industry for over 20 years. This indicates that the respondents have in-depth hands-on experience in the industry (figure 4.3).
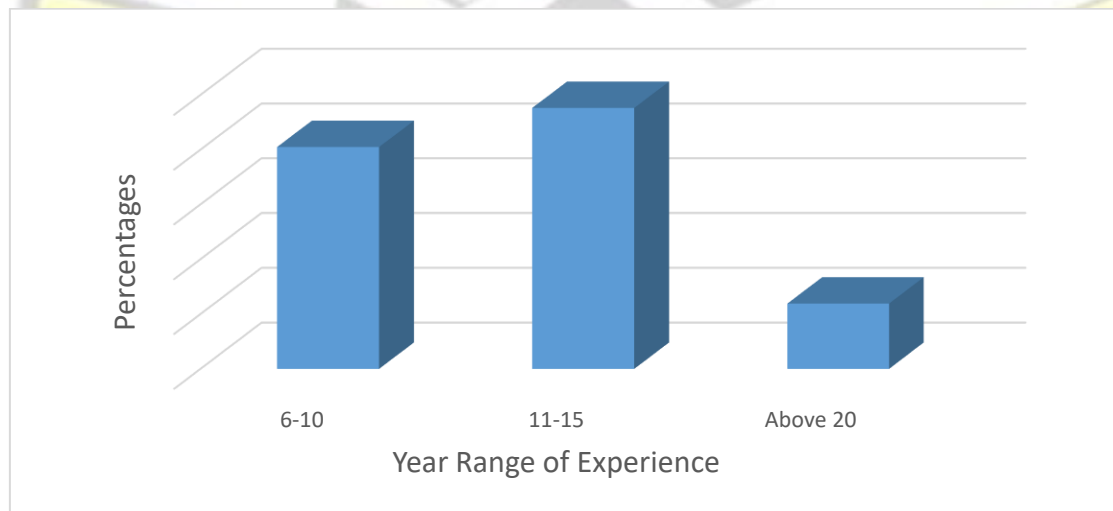
Figure 4.3: Level of Employees Experience in Ghana's Building Industry

Source: Field Survey (2019)

The objective of this study which was appropriately targeted at building construction firms that handle large commercial projects valued at over one million dollars was reaffirmed by the study findings. One hundred percent of all project management stakeholder respondents in all firms had undertaken projects with contract sums valued

between one million and 10 million US dollars (table 4.4). This, therefore, strengthens the validity and reliability of the findings of this study.

Table 4.4: Contract Values of Building Projects Executed by large firms in Ghana

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1M-10M	42	100.0	100.0	100.0

Source: Field Survey (2019)

4.3 Presentation of Study Findings

This section presents the data collected from the project survey with graphical interpretations in order for readers to better appreciate the findings of the study (Lynch, 2010).

4.3.1 Project cost management practices of building construction firms in Ghana

At the heart of this study was to identify the project cost management practices of building construction firms on large commercial building projects in Ghana, in order to assess their level of efficiency. Having asked respondents to select in a multiple response manner a list of 18 acclaimed project cost management practices and an option to indicate any other technique being implemented in their firms, the following results were derived. The traditional methods of overall profit and loss calculation, unit costing, cash flow forecasting, tender budgeting, elemental cost planning, financial cost reporting, working budget adjustments, work programmes, monitoring and record-keeping were dominantly being practiced by all the 42 respondents. Other listed cost management practices were rarely implemented with cost value reconciliation being practiced by 15 respondents, Earned value analysis being practiced by 4 respondents, Value management being used

45

by 2 respondents and cost code system being used by 2 respondents, all out of the total of a total of 42 respondents (figure 4.4 and table 4.5).

However, some listed project cost management practices such as S-Curves, managing cost by judgment and having site meetings to plan and manage cost were not being practiced at all. Meanwhile, these construction firms also use software packages for project cost management. The study showed that 90.5% of respondents within the firms selected used Microsoft Excel and the remaining 9.5% used Microsoft Project. Other software packages such as the BMI Intranet was not in use at all. This rather indicates low investments in sophisticated cost management information systems (figure 4.5).

Table 4.5: Project Cost Management Practices implemented by large firms in Ghana

Cost Management Practices	Responses	
	Frequency	Percent of Cases
Cost Value Reconciliation	15	35.7
Overall Profit and Loss	42	100.0
Unit Costing	42	100.0
Earned Value Analysis	4	9.5
Cash Flow Forecasting	42	100.0
Tender Budgeting	42	100.0
Elemental Cost Plan	42	100.0
Financial Cost Reporting	42	100.0
Value Management	2	4.8
Cost Code System	2	4.8
Working Budget	42	100.0
Works Programmes	42	100.0
Record Keeping	42	100.0
Monitoring and Inspection of Works Prog.	42	100.0

Source: Field Survey (2019)
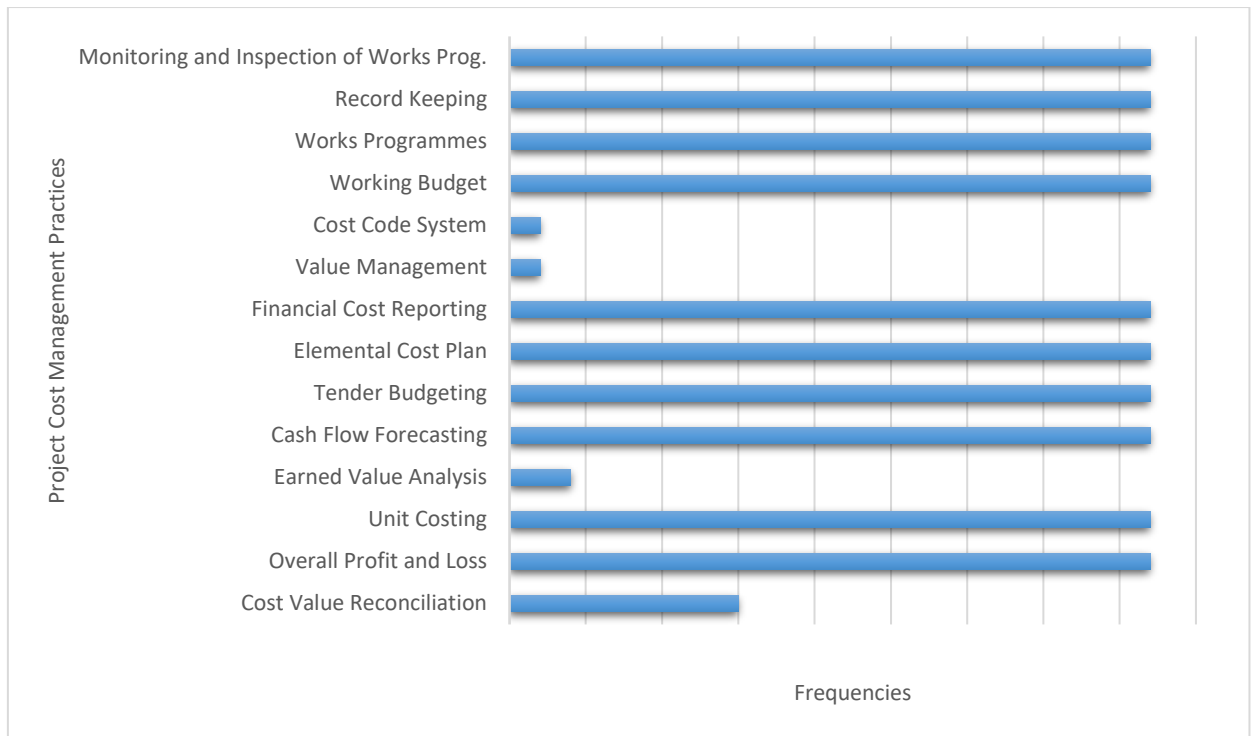
Figure 4.4: Project Cost Management Practices frequencies by respondents in

large firms in Ghana

Source: Field Survey (2019)
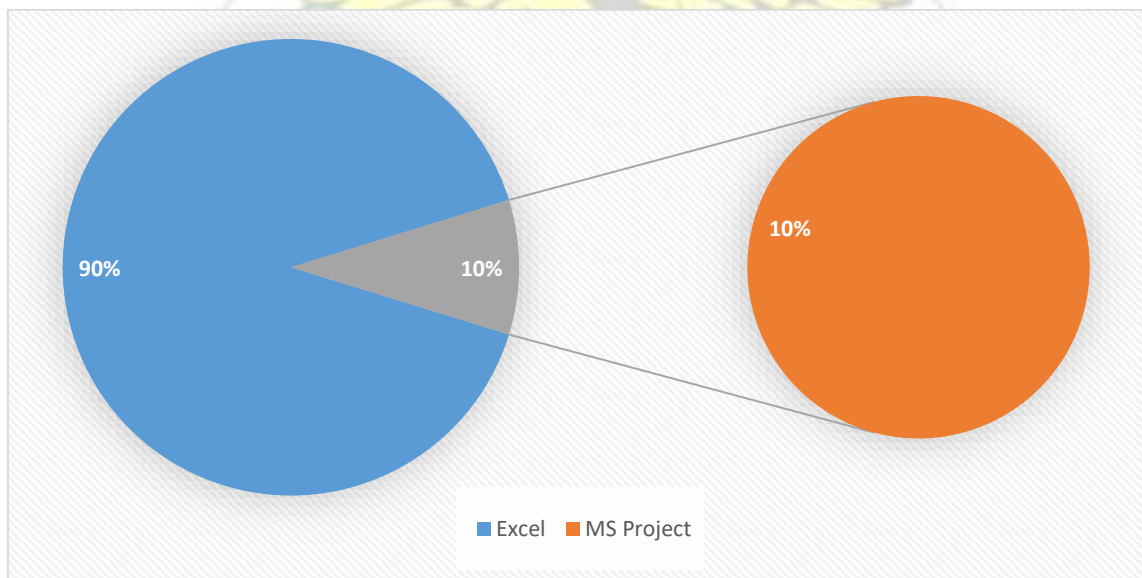
Figure 4.5: Software Packages used by Large Building Construction Firms in

Ghana

Source: Field Survey (2019)

To test the effectiveness and efficiency of these factors, respondents were asked to rank the various cost management practices on a Likert Scale ranging from not effective with a weight of (1), somewhat effective with a weight of (2), effective with a weight of (3) to very effective with a weight (4). For instance, to calculate the RII of Tender Budgeting and Estimating Cost Management Practices, we have table 4.6 showing a frequency of 42 for Very Effective and a zero (0) score for the rest of the scale. Which means all 42 respondents who implemented that practice ranked it as very effective.

$$A = 4$$

$$N = 42$$

Therefore,

$$RII = \sum \frac{4n_4 + 3n_3 + 2n_2 + 1n_1}{4 \times N}$$

$$= \frac{(4 \times 42) + (3 \times 0) + (2 \times 0) + (1 \times 0)}{4 \times 42} = \frac{168}{168} = \mathbf{1.00}$$

By calculating the relative importance index (RII) of their responses, the survey showed that overall profit and loss management, unit costing and tender budgeting and estimation were ranked the most effective project cost management practices with relative importance indices of 1 each. The next effective practices implemented were software packages, record keeping, works programmes usage, cash flow forecasting, elemental cost planning and financial cost reporting which were all ranked 4th with an RII of 0.75. The least effective were those of earned value analysis, cost code system, value management with ranks of 13th, 14th and 15th respectively (see table 4.6).

Table 4.6: RII and Ranking of the Effectiveness of Project Cost Management

Practices

No.	The Effectiveness of Project Cost Management Practices	Very Effective	Response Frequencies			Relative Importance Index (RII)	Rank
			Effective	Somewhat Effective	Not Effective		
1	Project Cost-Value Reconciliation	15	0	0	0	**0.36**	12
2	Overall Profit and Loss	42	0	0	0	**1.00**	1
3	Unit Costing	42	0	0	0	**1.00**	1
4	Earned Value Analysis	0	4	0	0	**0.07**	13
5	S-Curves	0	0	0	0	**0.00**	16
6	Cash Flow Forecasting	0	42	0	0	**0.75**	4
7	Tender Budgeting/Estimating	42	0	0	0	**1.00**	1
8	Elemental Cost Plan	0	42	0	0	**0.75**	4
9	Financial Cost Reporting	0	42	0	0	**0.75**	4
10	By Judgment	0	0	0	0	**0.00**	16
11	Value Management	0	0	2	0	**0.02**	15
12	Cost Code System	0	2	0	0	**0.04**	14
13	Working Budget/ On-going Job Budgeting	0	0	42	0	**0.50**	10
14	Works Programmes	0	0	42	0	**0.50**	10
15	Record Keeping	0	42	0	0	**0.75**	4
16	Monitoring and Inspection of Work Performance	0	42	0	0	**0.75**	4
17	Site Meetings	0	0	0	0	**0.00**	16
18	Software Package	0	42	0	0	**0.75**	4

Source: Field Survey (2019)

Moreover, other factors that directly and indirectly influence the effectiveness of project cost management practices were also identified. The study first sought to find out the procedure followed to develop total project cost estimates. Given the flexibility of selecting more than one option, results showed that all the 42 responses of key project management stakeholders indicated the use of conceptual estimation prepared from means book, comprehensive line item estimates prepared on project drawings and cost estimating software. Cost estimates based on similar projects in the past were simply not a strategy they opted for (refer to table 4.7).

Table 4.7: Project Cost Estimate Procedure applied by Large Commercial Building Construction Firms

Project Cost Estimate Procedure	Responses	
	Frequency	Percent
Conceptual estimate is prepared from the Means book or a similar standard reference	42	100
Comprehensive line-item estimate is prepared based on the drawings and project specifications by referring to Means Book	42	100
Comprehensive formal estimate is prepared with the help of a cost estimating software and project cost historical database	42	100

Source: Field Survey (2019)

Furthermore, the procurement planning processes of various construction firms were examined. The respondents were given the chance to choose as many procurement planning processes as applied in their organizations, in a multiple response manner. The results show that all the 42 respondents use a formal procurement plan based on the resource requirements schedule for project activities. 10 of the respondents developed procurement plans based on critical activities in the project schedule and 8 of the respondents developed their procurement plans based on milestone dates in the project schedules (see table 4.8).

50

Table 4.8: Procurements Practices by Large Commercial Building Construction Firms

Procurement Practices	Responses	
	Frequency	Percent
A procurement plan is developed based on the milestone dates in the project schedule	8	19
A procurement plan is developed based on the critical activities in the project schedule	10	23.8
A formal procurement plan is developed based on the resource requirements for every activity in the scheduled	42	100

Source: Field Survey (2019)

Finally, the overall effectiveness of project monitoring and control decision-making, as well as communication structures and process, were also assessed. The survey reveals that 76.2% of respondents considered their project monitoring and control decision-making strategies as average and 23.8% regarding it as below average, in terms of its impact on the goal of completing projects successfully within schedule (figure 4.6). While 66.7% of respondents indicated that the efficiency of their communication structure was average, 33.3% pointed out that the efficiency of their communication structure was above average.

Figure 4.6: Project Monitoring and Control Decision Making

Source: Field Survey (2019)

4.3.2   Factors that affect project cost management of large commercial building projects in Ghana

Another critical part of fulfilling the purpose of this research project was to identify the factors that affect project cost management of large commercial building projects in Ghana. Having subjected the industry to forty-three (43) test factors and calculated the relative importance index (RII) of each factor with their associated ranking, it was revealed that although all the identified factors were considered as influencing factors, some factors were ranked as very critical for efficient cost management. Underestimation of project cost, poor leadership and supervision of workmen, shortage of materials, building prices and cost fluctuations, poor site management, lack of programme of works, inefficient project planning practices, poor building design, frequent breakdown of machinery, inefficient deployment of resources and shortage of skilled labor were ranked by building construction project management stakeholders as the most important

52

factors that affect their project cost management prowess. These factors scored a relative importance index of one (1) and were therefore ranked first (1st). Other factors that were also worth considering included the unfavorable location of project sites, undue diligence in the procurement of required project facilities and materials, excessive wastage of materials, unskilled equipment operators and inefficient logistics management. These factors scored RII of 0.97, 0.97, 0.96, 0.96 and 0.96 respectively, but with rankings of 12th, 12th, 14th, 14th, and 14th respectively. The least considered factors that affect project cost management, their RII and rankings are Obtaining permits from district, municipal or metropolitan assemblies (0.77, 40th), ineffective communication structure among project team members (0.76, 41st), inefficient waste management on sites (0.76, 41st) and bad weather conditions (0.65, 43rd) as calculated below. Please refer to table 4.9 to appreciate the statistics further.

$$A = 4; \ N = 42$$

$$RII \ for \ Bad \ Weather \ Condition = \sum \frac{4n_4 + 3n_3 + 2n_2 + 1n_1}{4 \times N}$$

$$= \frac{(4 \times 18) + (3 \times 2) + (2 \times 9) + (1 \times 13)}{4 \times 42} = \frac{109}{168} = \mathbf{0.6488} \approx \mathbf{0.65}$$

The study further went on to unravel the inherent challenges that engulf project cost management efficiency. Respondents were allowed to select multiple challenges which they encounter. Top challenges selected out of 520 responses are as follows; poor attitude towards ICT usage (8.1%), difficulty in monitoring different sources of day to day cost (8.1%), using obsolete methods and concepts (8.1%), overemphasizing results and ignoring the process of project cost control (PCC) (8.1%), serious decision failure (8.1%), inadequate technical know-how (8.1%), abandonment of complicated strategies (8.1%), unplanned additional works (8.1%), intermittent design changes and management (8.1%), and fluctuation in material cost (8.1%). However, lack of financial commitment in projects had 35 responses representing 6.7%, lack of suitable PCC

processes and systems received 31 responses at 6% and the inconsistency of cost

management by project managers received 34 responses representing 6.5%. Please check

figure 4.7 for a graphical view.

Table 4.9: RII and Ranking of Factors Affecting Project Cost Management

| No.	Factors Affecting Project Cost Management	Very Important	Response Frequencies			Relative Importance Index (RII)	Rank
			Important	Somewhat Important	Not Important		
1	Delay in honoring payment certificates	35	7	0	0	0.96	17
2	Underestimation of cost of projects	42	0	0	0	1.00	1
3	Intermittent changes in project design by clients	31	11	0	0	0.93	24
4	Difficulty in accessing bank credit	33	9	0	0	0.95	20
5	Poor leadership and supervision of laborers	42	0	0	0	1.00	1
6	Underestimation of Project Completion time by contractors	32	10	0	0	0.94	22
7	Shortage of materials	42	0	0	0	1.00	1
8	Poor professional management	33	4	5	0	0.92	28
9	Building materials price and cost Fluctuations	42	0	0	0	1.00	1
10	Poor site management	42	0	0	0	1.00	1
11	Sub-standard construction procedures	31	8	3	0	0.92	28
12	Delay in instructions from contractors and other consultants	25	12	5	0	0.87	35
13	Lack of Programme of works	42	0	0	0	1.00	1
14	Ineffective project planning practices	42	0	0	0	1.00	1
15	Poor design	42	0	0	0	1.00	1
16	Frequent breakdown of equipment	42	0	0	0	1.00	1
17	Inefficient Logistics Management	36	6	0	0	0.96	14
18	Obtaining permit from municipality	23	6	6	7	0.77	40
19	Ineffective communication structures among project team members	22	6	8	6	0.76	41
20	Inefficient deployment of resources	42	0	0	0	1.00	1
21	Shortage of skilled labor	42	0	0	0	1.00	1
22	Legal disputes	34	2	1	5	0.89	34
23	Unfavorable site conditions	37	1	4	0	0.95	20
24	Discrepancy between design specification and building code	33	4	2	3	0.90	32
25	Bad weather conditions	18	2	9	13	0.65	43
26	Mistakes with soil investigations	30	6	6	0	0.89	33
27	Unskilled equipment operators	36	6	0	0	0.96	14
28	Unavailability of ready funds	33	6	3	0	0.93	26
29	Excessive wastage of material	36	6	0	0	0.96	14
30	Ineffective conflict management among project stakeholders	24	10	8	0	0.85	37
31	Accidents during construction	25	9	3	5	0.82	38
32	Lack of Appropriate Software	30	8	4	0	0.90	31
33	Unfavorable Government Policies and Regulatory Framework	31	11	0	0	0.93	24
34	Undue diligence in procurement of requires project facilities and materials	37	5	0	0	0.97	12
35	Inefficient waste management on sites	22	6	8	6	0.76	41
36	Unstructured payment mechanisms	32	7	3	0	0.92	27
37	Pilfering and embezzlement at sites	33	8	1	0	0.94	22
38	Ineffective Project Risk Management	37	5	0	0	0.97	12
39	Unfavorable location of project sites	35	7	0	0	0.96	17
40	Inadequate/Inappropriate application of construction management technologies	32	6	4	0	0.92	28
41	Project quality control and monitoring lapses	34	8	0	0	0.95	19
42	Unfavorable Social Factors at Project Sites	23	6	8	5	0.78	39
43	Complexity of the project	27	8	7	0	0.87	35

Source: Field Survey (2019)
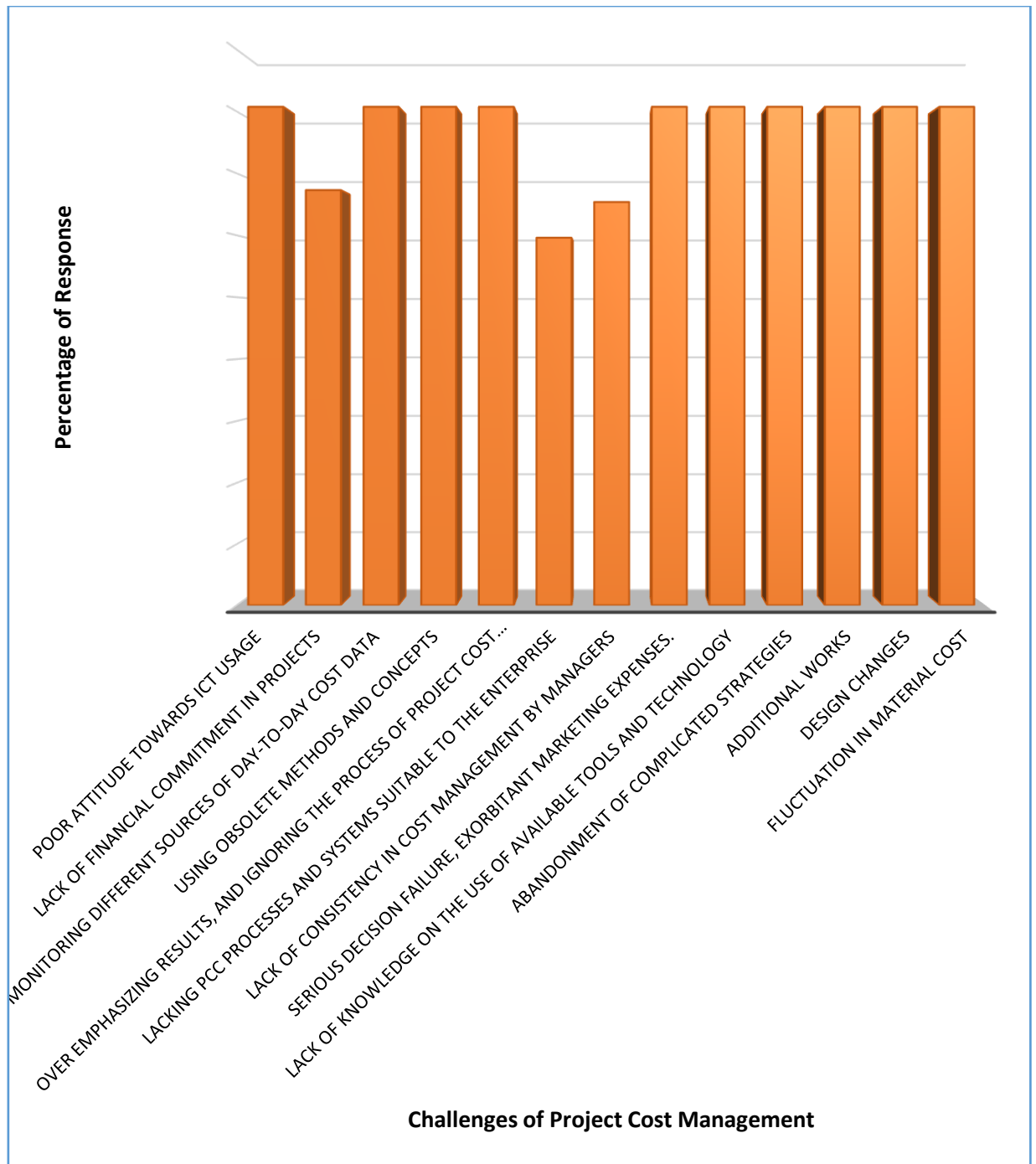
Figure 4.7: Project Cost Management Challenges of Large Commercial Building Firms

Source: Field Survey (2019)

4.4 Discussion of Findings

Simply presenting research findings devoid of scholarly inferences and discussion of them in relations to previous findings, theories and models in other works renders it meaningless (Saunders et. al., 2009). This section presents a thorough discussion of the findings of this study.

The building construction industry in Ghana is a complex interrelated system of several players with apt academic credentials and profound experience. A chunk of firms in the industry operate on a small scale using improved and basic building tools and techniques. Project cost management has remained a nightmare as project stakeholders continue to struggle to efficiently manage cost on large commercial building projects. Unfortunately, the current active players in the industry have adhered to traditional methods that render cost management of projects sub-optimal. The factors that affect project cost management are varied and interrelated, with tremendous implications for overall project performance.

Project cost management practices of large commercial building construction projects in Ghana are technically limited in scope. They are again not coordinated in real time between and among the stakeholders involved. It is obvious from the study findings that building construction firms in Ghana have not moved from the previously implemented cost management practices. The major practices remain unit costing, cash flow forecasting, tender budgeting, elemental costing and planning, financial cost reporting, working budge adjustment, works programmes and record keeping. This is consistent with the findings of Olawale and Sun (2010). These practices being implemented by firms on large commercial building projects are good but they have outlived their efficiency over time. Giving the level of complexity of building design requirements of

clients, these outlined practices do not ensure cost efficiency of such large building projects. Besides the level of education of project managers does not appear to be commensurate with the knowledge being deployed.

It was also observed, that the cost management practices of large commercial building construction firms do not seem to embed active management information systems in their activities. Instead, they thrive on simplistic principles that negatively affect project duration and cost. Notwithstanding the improved project monitoring and decision-making, as well as procurement processes, communication systems are inhibited intermittently which further affects project activities execution. These findings conform to that of Azis et al. (2012). Finally, the total project estimate methodology is done in a skewed manner, emphasizing conceptual line-item or project drawings. Simulation models are non-existent, thus cost estimates are nearly non-strategic.

It is unequivocal that the factors affecting the project cost estimates of large commercial building projects in Ghana emanate from weak internal structures than external factors. Underestimation of project cost, poor leadership and supervision of workmen, shortage of building materials, building material price fluctuations, lack of work programme, ineffective project planning practices, poor building design and changes, shortage of skilled labor and the inefficient deployment of resources were among the main factors affecting project cost management in Ghana. It can also be noticed that the identified factors are inextricably intertwined with the challenges that building construction firms are confronted with. A quick analysis reveals that because most of the challenges faced are associated with low patronage of modern technologies in the industry. Again, the general lack of planning and uncoordinated project activists further reinforces negative cost management influencing factors.

These findings are conformed to that of Enshassi et al. (2009) where price fluctuations of building materials, inefficient resource management and design changes were some of the major factors identified. Again, the findings of this research concur with that of Olawale and Sun (2010) which listed design changes, inaccurate estimation of project duration, price fluctuations and complexity of project as major factors affecting project cost management.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This final chapter focuses mainly on providing a summary of the study findings, a general conclusion and the proposed project cost management model for large commercial building construction industry.

5.2 Summary of Findings

The building construction industry in Ghana is a complex interrelated system of several players with apt academic credentials and profound experience. A chunk of firms in the industry operate on a small scale using improved and basic building tools and techniques. A few of the firms work on large commercial building projects with contracts value between one million and ten million US dollars. This study's survey confirmed that the industry has a youthful and exuberant workforce handling the affairs of large commercial building construction project cost management in Ghana and employees have in-depth hands-on experience in the industry.

Project cost management practices of large commercial building construction projects in Ghana are technically limited in scope. They are again not coordinated in real time between and among the stakeholders involved. The major practices remain unit costing, cash flow forecasting, tend budgeting, elemental costing and planning, financial cost reporting, working budge adjustment, works programming and record keeping.

The cost management practices of large building construction firms do not seem to embed active management information systems in their activities. Instead, they thrive on simplistic principles that affect project duration and cost. Total project estimate

methodology is done in a skewed manner, emphasizing conceptual line-item or project drawings.

The factors affecting the project cost estimates of large commercial building projects in Ghana emanate from weak internal structures than external factors. Underestimation of project cost, poor leadership and supervision of workmen, shortage of building materials, building material price fluctuations, lack of work programme, ineffective project planning practices, poor building design and changes, shortage of skilled labor and the inefficient deployment of resources were among the main factors affecting project cost management in Ghana.

5.3 General Conclusion

The efficient management of large commercial building project cost in Ghana is at the crux of building construction firms. A lot of construction firms resort to traditional methods of estimating, monitoring and controlling project cost. A lot more firms have also failed to apply sophisticated technologies in analyzing project activities, communication processes and cost estimation processes. Moreover, the factors that affect project cost management spans the internal and external operational environment of construction project value chains. Consequently, these firms have to surmount numerous challenges in order to minimize the impact of the factors that affect project cost management. To achieve optimal project cost leadership, all building construction firms in Ghana should adopt a project cost management system that ensures continues communication and collaboration among project stakeholders towards identifying the critical project cost center along the project value chain, setting cost performance targets, identifying factors that affect project cost centers, assessing cost implications on the entire project and recommending tailor-made project cost management solutions.

5.4 Recommendations

This study has generally shown that building construction firms in Ghana are bedeviled by numerous factors that tend to render their activities inefficient and ineffective. It is also established that these firms lack advanced project cost management technologies and strategic model systems that affect overall project cost and profitability. To rectify this menace, it is advised that building construction firms should adopt and apply the following project cost management strategies and modeling system developed in this study (figure 5.1), in order to optimize their cost management efficiencies.

Identify critical cost centers along the project value chain. First of all, it is recommended that firms in Ghana's building construction industry should meticulously identify critical project stages that are sensitive to cost. This process must take into consideration all internal and external stakeholders that directly and indirectly impact the cost performance outcome of the project.

Set cost performance targets. Secondly, project team members must specify cost performance targets at every stage of the cost centers identified in the first stage. These cost performance targets should be aimed at ensuring cost leadership, where cost targets do not only conform to industrial standards but also competitively positioned to ensure sustainable profitability, high quality and edge in the building construction industry. Again, cost targets should be set in collaboration with all players at every cost center identified.

Identify factors that affect project cost centers. In addition to the above, it is equally crucial to identify all possible factors that may affect the effective management of project cost along the entire project activity value chain and each of the various cost centers. This can be further scrutinized by testing the relative importance index of these factors.

It must be added that in assessing the factors, both internal and external business environmental factors should be considered to make the whole process comprehensive.

Assess cost implications on the entire project. Moreover, it is necessary at this stage of the model to analyze and assess the cost implications of one cost center on all other cost centers as well as all other stages of the project. This recommendation is vital for simulating the cost patterns at every stage of the building construction project. In that, project managers can conveniently appreciate how an activity that is carried out at the early stages of the project would affect the cost of other activities at the later stage of the project. For instance, they can identify how processes at the foundation stage can affect roofing activities.

Diagnosis. After conducting the analysis at the first four stages of this proposed model, it is essential to compile the results at every stage into a common pool to guide cost management recommendations. This stage outlines the essential parts of the analysis upon which project management decision making is done. The feedback from the diagnosis also directs real-time changes that must be rectified at various stages of the process.

Recommend solutions. It is now appropriate to make well-informed project cost management recommendations of measures to optimize the cost of project activities, enhance profitability and evaluate the performance outcome of every stage of the project.

Install an enterprise information system. The final stage of the process involves the installation of an enterprise-wide management information system that provides a platform for entering the results diagnosed from the model process, sharing cost information among various project stakeholders and evaluating the cost performance at every stage of the process in real-time and in a seamless manner.
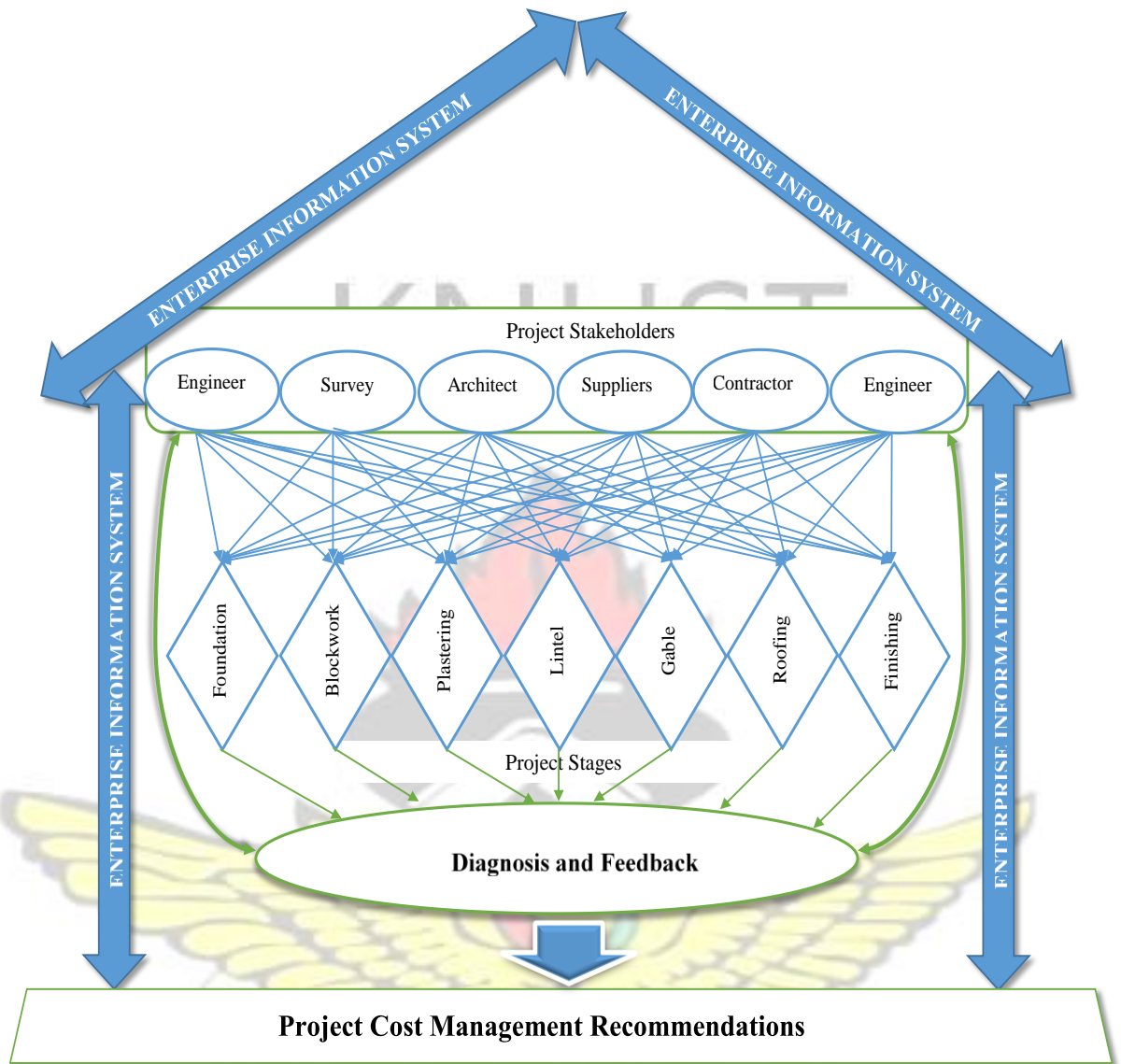
Figure 5.1: Proposed Cost Management Engineering Model for Large

Commercial Building Construction Projects in Ghana

Source: Researcher's own construct

5.5 Contribution of the Project and Future Research Directions

This project aimed at analyzing the cost management practices of large commercial building projects in Ghana, exploring the sensitivity of factors that affect project cost management, and recommending holistic and efficient project cost management measures that ensure optimal quality and profitability.

Future research should however specifically develop measures to calculate the extent to which each project management activity affects the total project cost a. Additionally, future research projects should also assess how the incessant modification of architectural design and inefficient communication structures during project periods can affect total project cost. Finally, the study methodology should also be extended to other industries such as manufacturing.

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KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY,

KUMASI DEPARTMENT OF BUILDING TECHNOLOGY

(Questionnaire for Project Team)

Introduction

The researcher is a student at the Kwame Nkrumah University of Science and Technology who is currently pursuing MSc. Project Management. This questionnaire is intended to solicit your view and information on the project topic: **Factors Affecting Project Cost Management of Large Commercial Building Projects in Ghana**.

The objectives of the study are:

d) Identify the project cost management practices of building construction firms in Ghana;

e) Identify specific factors that affect project cost management of large commercial building projects in Ghana; and

f) Identify measures to improve project cost management of large commercial building projects in Ghana.

This study is for academic purpose only and any information provided would be treated as confidential.

Instruction: *Please respond to the following questions by ticking the appropriate answer from the options given and provide written answers where necessary.*

General Information

1. Name of Organization: …………………………………………………………..

2. Gender? a) Male ☐   b) Female ☐

3. Age?   a) 15-30years ☐   b) 31-50years ☐   c) 51 years and above ☐

4. Academic qualification obtained?

   a) PhD ☐

   b) Master's Degree ☐

   c) Bachelor's Degree ☐

   d) Senior High School Certificate ☐

   e) Basic Education Certificate ☐

   f) Vocational   Education..(*Please specify)*

   g) Others…………………………….…………………………………………….

5. Department?...

   Designation……………………………

6. No. of years in industry: …………………………………………………………..

7. Highest Value of Contract Executed:

   Below 1M ☐   1M – 10M ☐   10M – 20M ☐ 20M – 30M ☐ Above 30M ☐

Project Cost Management Practices of Building Construction Firms in Ghana (A)

8. What cost management practices do you implement on large commercial building projects? Please select all that applies

   a) Project Cost-Value Reconciliation ☐

b) Overall Profit and Loss ☐

c) Unit Costing ☐

d) Earned Value Analysis ☐

e) S-Curves ☐

f) Cash Flow Forecasting ☐

g) Tender Budgeting/Estimating ☐

h) Elemental Cost Plan ☐

i) Financial Cost Reporting ☐

j) By Judgment ☐

k) Value Management ☐

l) Cost Code System ☐

m) Working Budget/ On-going Job Budgeting ☐

n) Works Programmes ☐

o) Record Keeping ☐

p) Monitoring and Inspection of Work Performance ☐

q) Site Meetingst ☐

9. Which software do you use for cost estimating?

h) None ☐

i) MS Excel ☐

j) MS Project ☐

k) Primavera ☐

l) Other …………………………………………….Please specify

10. How Effective and Efficient are the Cost Management practice implemented on large commercial Building Construction Project? Please indicate by ticking the appropriate column.

No.	Project Cost Management Practices	Very Effective	Effective	Somewhat Effective	Not Effective
1.	Project Cost-Value Reconciliation				
2.	Overall Profit and Loss				
3.	Unit Costing				
4.	Earned Value Analysis				
5.	S-Curves				
6.	Cash Flow Forecasting				
7.	Tender Budgeting/Estimating				
8.	Elemental Cost Plan				
9.	Financial Cost Reporting				
10	By Judgment				
11.	Value Management				
12	Cost Code System				
13.	Working Budget/ On-going Job Budgeting				
14.	Works Programmes				
15.	Record Keeping				
16.	Monitoring and Inspection of Work Performance				
17.	Site Meetingst				
18.	Software Package				

11. What procedure is followed to develop the Total Project Cost Estimate?

   a) An informal estimate is prepared based on the actual costs of similar projects in the past. ☐

   b) A conceptual estimate is prepared from the Means book or a similar standard reference. ☐

   c) A comprehensive line-item estimate is prepared based on the drawings and project specifications by referring to Means Book. ☐

d) A comprehensive formal estimate is prepared with the help of a cost estimating software and project cost historical☐atabase.

e) Other

    …………………………………………………………………………….

12. How is procurement carried out in organization (*Note: Procurement refers to the ordering, expediting, and delivering of key project equipment and materials, especially those that may involve long delivery periods.*)

a) No formal procurement planning is done   ☐

b) A procurement plan is developed based on the milestone dates in the project schedule☐

c) A procurement plan is developed based on the critical activities in the project schedule.☐

d) A formal procurement plan is developed based on the resource requirements for every activity in the schedule ☐

13. How will you rate your Communications plan for projects in your organization? (*Note: A Communication plan provides for disseminating information on project goals, progress, and outcomes that can generate enthusiasm and buy-in from stakeholders.*)

a) Unsatisfactory☐

b) Below Average ☐

c) Average ☐

d) Above Average ☐

e) Excellent ☐

14. How would you describe the effectiveness of the decisions made in the project monitoring and control phase to fulfill the goal of completing the projects successfully? (*For e.g. Delivery of material for a critical activity got delayed. What steps/decisions did you take to bring the project back on track? Were these decisions effective in completing the project on time and within budget?*)

   a) Unsatisfactory ☐

   b) Below Average ☐

   c) Average ☐

   d) Above Average ☐

   e) Excellent ☐

15. What are the challenges associated with managing large building commercial project cost? (*thick all that apply*)

   a) Poor attitude towards ICT usage ☐

   b) Lack of financial commitment in projects ☐

   c) Difficulty in monitoring different sources of day-to-day cost data ☐

   d) Using obsolete methods and concepts ☐

   e) Over emphasizing results, and ignoring the process of Project Cost Control (PCC) ☐

   f) Lacking PCC processes and systems suitable to the enterprise ☐

   g) Lack of consistency in cost management by managers ☐

   h) Serious decision failure, exorbitant marketing expenses. ☐

   i) Lack of knowledge on the use of available tools and technology ☐

   j) Abandonment of complicated strategies ☐

   k) Additional works ☐

   l) Design changes ☐

m) Fluctuation in material cost ☐

n) Others……………………………………………………………………………

………………………………………………………………………………

Factors that Affect Project Cost Management of Large Commercial Building Projects in Ghana (B)

16. Please indicate by ticking the appropriate column the relative importance of each of the following factors that affect project cost management of large commercial building projects.

No.	Factors that Affect Project Cost Mgt.	Very Important	Important	Somewhat Important	Not Important
1.	Delay in honoring payment certificates				
2.	Underestimation of cost of projects				
3.	Intermittent changes in project design by clients on				
4.	Difficulty in accessing bank credit				
5.	Poor leadership and supervision of laborers				
6.	Underestimation of Project Completion time by contractors				
7.	Shortage of materials				
8.	Poor professional management				
9.	Building materials price and cost Fluctuations				
10	Poor site management				
11.	Sub-standard construction procedures				
12	Delay in instructions from contractors and other consultants				
13.	Shortage/Late deliveries of building materials				
14.	Lack of Programme of works				
15.	Ineffective project planning practices				
16.	Poor design				
17.	Frequent breakdown of equipment				
18.	Inefficient Logistics Management				
19.	Obtaining permit from municipality				

No.	Factors that Affect Project Cost Mgt.	Very Important	Important	Somewhat Important	Not Important
20.	Ineffective communication structures among project team members				
21.	Inefficient deployment of resources				
22.	Shortage of skilled labor				
23.	Legal disputes				
24.	Unfavorable site conditions				
25.	Foundation conditions encountered on site				
26.	Discrepancy between design specification and building code				
27.	Bad weather conditions				
28.	Mistakes with soil investigations				
29.	Unskilled equipment operators				
30.	Unavailability of ready funds				
31.	Excessive wastage of material				
32.	Ineffective conflict management among project stakeholders				
33.	Accidents during construction				
34.	Lack of Appropriate Software				
35.	Unfavorable Government Policies and Regulatory Framework				
36.	Undue diligence in procurement of requires project facilities and materials				
37.	Inefficient waste management on sites				
38.	Unstructured payment mechanisms				
39.	Pilfering and embezzlement at sites				
40.	Ineffective Project Risk Management				
41.	Unfavorable location of project sites				
42.	Inadequate/Inappropriate application of construction management technologies				
43.	Project quality control and monitoring lapses				
44.	Unfavorable Social Factors at Project Sites				
45.	Complexity of the project				

Improve Project Cost Management of Large Commercial Building Projects in Ghana (E)

17. Do you apply any special model, theory or strategy to improve project cost management on large commercial buildings?

    a. Yes ▢   b. No ▢

    If yes, please give details …………………………………………….………………

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    Thank you for your time