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An Investigation into the Application of Construction Planning Tools and Techniques by small scale contractors in the Ghanaian Construction Industry

By

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DECLARATION

I hereby declare that this submission is my own work towards the MSc Construction Management and that, to the best of my knowledge, it contains no material previously published by another person, nor material which has been accepted for the award of any other degree of the University, except where due acknowledgement has been made in the text.

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ABSTRACT

Construction projects like other projects are guided by objectives which are achieved when effective planning is deliberately done. Moreover, quality is assured with effective planning. Irrespective of the activities undertaken on a construction projects, due diligent to planning is essential which adapts accepted techniques for the realization of the project objectives. Small Scale Construction Firms (SSCF) are challenged with the application of the planning tools, therefore, the study aims at investigating into the construction planning tools and techniques used by SSCF in the Ghanaian Construction Industry. Review of existing literature was carried out to identify the factors and it was followed by questionnaire survey to the respondents. 73 questionnaire were retrieved out of 80 questionnaires administered. The analysis was consequently grounded on this response rate. Mean Score Ranking and Relative importance index were the analytical tools used on the data collected. The following findings were identified from the study; respondents indicated that organizations utilized only simple tools, and tools that require less training to use. Furthermore, it was revealed that management problems, limited project planning, knowledge, awareness problems, policy problems are the challenges faced by SSCF in the implementation of construction planning tools and techniques. The following recommendations were made due to the findings of the study; construction professionals should have formal training in construction planning education in order to apply construction planning and techniques tools, or otherwise organizations should employ the services of qualified construction planning professionals to undertake construction planning.

TABLE OF CONTENT

LIST OF TABLES

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DEDICATION

This thesis is dedicated with love and gratitude to the Almighty God. My family members who showed immense love and support towards my education. Thank you all and may God Richly Bless You

CHAPTER ONE

INTRODUCTION

1.1 Background

Globally, the building industry is known to have an important contribution in the socio-economic growth of every country. Owusu-Sechere (2008) stated that, infrastructure development and opportunity for employment has been associated to the industry, which is all key indicators to the socio-economic growth of countries. Construction contributes about 10.5% of the Gross Domestic Products (GDP) and employed about 6% of the economically active population (Ghana Statistical Services, 2013). However, despite the substantial role of construction in the economy, numerous studies have indicated that there are large numbers of unsuccessful construction projects implementation in the construction industry due to the inability or limited practicing of planning techniques (Hayford and Sarfraz, 2013). They further clarified that, though the level of planning tools and techniques application within the larger firms is much more utilized, there still appear to be constrictions in terms of its utilization.

In the developing economies which Ghana is not an exemption, there exist more Small Scale Construction Firms as related to Large Scale Construction Firms (Kenny, 2007). The importance of Small Scale Construction firms in every country can never be underestimated, as they have crucial role in the countries especially the developing. Increasing importance has been given to Small Scale Construction Firms in the building industry of Ghana. Nonetheless, they have received a lot of attention from government in developing countries (Raynard and Forstater, 2002; Forstater et al., 2006), as a result of the role that they play.

Construction implementation as Murphy and Ledwith (2007) writes is the core area of construction that clarifies the appropriate tool or techniques to use in defining, planning during the implementation stage of the project. Ko and Cheng (2003) indicated that, planning of construction activities is the process of achieving the objectives of construction by construction resources. The Project Management Institution (2000) added that, construction planning applies knowledge, skills, techniques and tools to decide on the suitable resources required to achieved the project objectives of working within time, within or on budget and delivering a quality project This is fully echoed by Baccarini (1999) who emphasized that, present construction planning owes to three principal stimuli:

- Complexity – Emerging complexity of task as well required for a great mark of knowledge.
- Change –Advancing innovative environments with unchanging pressure within organizations to implement as a result of universal competition.
- Time – Call for tasks to be done as swiftly as possible.

Nonetheless, current construction planning has grown as a field of specialty continuously restructuring it capabilities to integrate itself in current practices (Murphy and Ledwith, 2007). Construction planning is a diffusion of trending problems, tools and techniques as well as methods of planning that integrate a field of discipline which are applied to diverse specialties, for diverse challenges in diverse cultures" as opined by Cawford *et al*. (2005).Numerous tools and techniques have been proposed and established for the purposes of planning construction in large organizations; yet Small Scale Construction Firms are weak in areas of initiating the project, planning and execution of project (Ledwith, 2004). As Murphy and Ledwith (2007) write, small scale contractors demonstrated limited use of planning tools and techniques are not

benefiting from management of construction in terms of increase quality as well as services delivery. Construction planning tools and techniques as utilized by large firms has gained the interest of construction management researchers and has become an area of much research interest. Although it has become an area of much research interest, very little work has been done about construction tools and techniques appropriate planning construction projects for Small Scale Construction Firms. Thus, the study seeks to investigate into the application of construction planning tools and techniques employed on construction projects executed by Small Scale Construction Firms in the Ghanaian construction industry.

1.2 Problem Statement

Construction planning is very essential and crucial in increasing the quality requirement of a project and a major contributor in achieving a successful project outcome as advocated by Hayford and Sarfraz (2013). It is undoubted evidence that construction planning process or approaches involves the use of established tools and techniques irrespective of the complexity, location, value of the project during the planning process. Numerous tools and techniques have been proposed and established for the purposes of planning construction in large organizations; yet Small Scale Construction Firms are weak in areas of initiating the project, planning and execution of project (Ledwith, 2004). As Murphy and Ledwith (2007) writes, small scale contractors demonstrated limited use of planning tools and techniques are not benefiting from management of construction in terms of increase quality as well as services delivery. Construction planning tools and techniques as utilized by large firms has gained the interest of construction management researchers and has become an area for much research work. However though, very little work has been done about construction tools and techniques appropriate planning construction projects for Small Scale Construction

Firms. Thus, the study seeks to investigate into the application of construction planning tools and techniques employed on construction projects executed by Small Scale Construction Firms in the Ghanaian construction industry.

1.3 Research Question

The questions below were asked to form the basis for the study;

1. What are the construction planning tools and techniques most frequently use by small scale contractors in Ghana?
2. What are the challenges associated with the usage of these planning tools and techniques by the small scale contractors?
3. What strategies can be employed to enhance the use of construction tools and techniques utilized in planning of projects?

1.4 Aim and Objectives

1.4.1 Aim

The study aimed at investigating into the application of construction planning tools and techniques by Small Scale Construction Firms in the Ghanaian construction industry.

1.4.2 Objectives

The following objectives were formulated to assist in addressing the stated aim:

1. To identify construction planning tools and techniques most frequently adopted by small scale contractors in Ghana;
2. To identify the challenges associated with the adoption of these planning tools and techniques by the small scale contractors in the Ghanaian construction industry; and

3. To propose strategies to enhance the application of construction planning tools and techniques by small scale contractors in Ghana.

1.5 Scope of Study

Small Scale Contractors within the classification of D3K3 in the Greater Accra and Ashanti regions precisely Accra Metropolis and Kumasi Metropolis were the main focus of the study. These Metropolises were decided upon because most of the construction firms are saturated within the metropolis. These classes of contractors were chosen on the basis that they constitute the majority of construction companies in the country. Furthermore, they are predominantly visible in the main cities such as Kumasi and Accra, since major construction activities are undertaken in such jurisdiction because of high demand of housing units according to Ahiagu-Dagbui et al. (2011), as well as demonstrates limited use of construction planning tools and techniques and are not benefiting from management of construction in terms of increase quality as well as services delivery according to Murphy and Ledwith (2007).

1.6 Significance of The Study

As indicated above, quite a number of previous researches on construction planning tools and techniques have focused on large firms. Thus, the focus of this study is on Small Scale Construction Firms in Ghana. The study will aid construction practitioners in planning of projects especially SSCF, construction management researchers and investors in the application of construction planning tools and techniques. More than these, the study would contribute to available literature in the field of construction planning tools and techniques by small scale contractors.

1.7 Research Methodology

The study employed a quantitative research approach. Firstly, extant literature was reviewed, which became the basis for the development of questionnaires. Close ended questionnaires were developed for the study. Information was gathered from Small Scale Construction Firms with the classification D3K3 in the Greater Accra region and Ashanti region precisely Accra Metropolis and Kumasi Metropolis. Further, the responses of the questionnaire were analyzed using the Mean Score Ranking as statistical tool.

1.8 Outline of the study

The study comprises of five chapters, the chapters are inter-related since each chapter depends on the other for survival and facilitate a flow. Chapter 1 introduces the study by identifying the basis of the study through the problem statement. It further elaborates on the aim of the study and the stated objectives as well as the geographical scope and contextual scope for the study. Research works are conducted on the fringes of existing works, chapter 2 discusses literature on the subject matter which is directly and indirectly linked to the study.

The Chapter 2 discusses fully the construction planning tools and techniques most frequently adopted by small scale contractors in Ghana, identify the challenges associated with the adoption of these planning tools and techniques by the small scale contractors in the Ghanaian construction industry; and strategies to enhance the application of construction planning tools and techniques by small scale contractors in Ghana. Although all chapters are important as far as a study a concerned, however, Chapter 3 is the focal point for the study because it directs the position, orientation and direction of the study. It discussed the research strategy, data collection method and

analytical tools used for the study. Chapter 4 is the battle ground for the study since the actual analysis of the study is addressed in this section. All analytical tools used for the study are described and applied. In addition, the aim and objectives are addressed within this section. As there is an introduction to every scientific writing, there also exists a conclusion. Chapter 5 ends the study by summarizing the findings of the study and relating it to the various objectives. Moreover, a general conclusion is drawn at this stage to end the study. Finally, recommendations are made to the major stakeholders who were the focus of the study and even policy makers.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The chapter is purposed to make an extensive search and draw up absolute conclusions on the data elicited from the study; consequently, it is imperative to review germane literatures which link up with construction planning tools and techniques so as to bring into view the differences as well as the ratification to the object of study.

2.2 Characteristics of Small Scale Construction Firms

Small Scale Construction Firms refers to the non-subsidiary, self-governing firms which employ a comparative lesser number of employees. Actually, the number varies crossways the national statistical structures. The greatest recurrent upper limit is employees of the number 250, according to the European Union classification. Nevertheless, the United States of America has a limit of 200 employees. Small companies or firms are mostly those companies with less than 50 employees, whereas the micro-enterprises a maximum of ten of five employees in some cases (OECD, 2000).

Aside using the number of employees, the financial assets of the individual companies can also be used to categorize companies into small-sized or medium-sized firms. In the European Union for example, Small Scale Construction firms are obliged to have a maximum annual turnover of €40,000,000.00 with their balance-sheet within €27,000,000.00 balance sheet after valuation annually (OECD, 2000).

Across the world, different countries assume varying terms and settings, considering the key characters of Small Scale Construction firms. Characteristics of Small Scale

Construction firms can be discussed from the various perspectives including business structure, geographic characteristics, and how these companies carry out their duties. The main difference between the Large Scale Construction Firms (LSCF) and Small Scale Construction Firms is how these categorized business entities are held (between shareholders) as well as how these businesses are managed. This is called the business characteristics of the Small Scale Construction firms normally have a flat hierarchy aside having a combined set of business-enabling divisions. That is, a Small Scale Construction firm has a normal thin management structure (The Open Group, 2016).

Another dimension of small scale contractors is the location and operational presence. Usually, LSCF function globally as they have points of presences in multiple cities across the world, small scale contractors on the other hand restrict themselves to geographical boundaries and within a particular country even though this not a mandatory criterion. Again, the organizational structure of Small Scale Construction differs from the other enterprises, in that, small scale contractors are typically flatter as compare to LEs (The Open Group, 2016). A small scale firm might have one head office and a number of construction site, usually within the same city or in nearby cities. The functions of finance, administration, HR, Sales, Marketing etc. departments of a small and medium-sized firm are adjoined.

Small scale contractors have a major role to play in the growth of an economy through job creation and increasing a country's GDP. Small Scale Construction firm possess additional advantages of lesser business overheads, lower barriers, and comparatively quick decision paths; small scale contractors have as well the potential to grow faster, be highly efficient, and to be competitive locally and globally. In this context, IT has a significant role in enabling businesses to realize their set objectives as well achieve financial gains. IT has become increasingly commoditized and being offered as a

"service" or on a "pay-per-use" model; for Small Scale Construction firms, firms normally do not have a dedicated IT organization unlike the LEs (The Open Group, 2016).

Audretsch *et al.* (1998), compared Small Scale Construction firms to LEs, Small Scale Construction firms have some deficiencies and benefits. That is, they have a flexible system which eventually leads to innovations in the organization and the business environment as a whole. The Small Scale Construction firm operates within their own confine zones and does not compete with large organizations. Small Scale Construction firms are exposed to the opportunities and threat presents in the external environment and enhances communications within the organizations (Edwards *et al.*, 2001). Irrespective of the advantages exhibited by the small scale contractors, they are confronted with diseconomy of scale, difficulty in organizational learning and understanding the scope of their operations (Murphy and Ledwith, 2007). It is also indicated that most of the entrepreneurs as well as projects in Small Scale Construction firms are normally weak considering marketing, motivation and management (Ledwith, 2004).

2.2.1 Role of Small Scale Contractors in the Ghanaian Construction Industry

Small scale contractors are in charge of the creation of over 90% of jobs in the emerging countries and as well contribute to national income through taxation and other means (Abor and Quartey, 2010). According to Abor and Quartey (2010), in Ghana, small scale contractors as well as other small scale contractors usually contribute about 75% of the country's GDP as well being responsible for about 92% of registered trades. The contribution of small and medium scale enterprise in the construction sector is weighty. Ofori (1993) pointed out that, Small Scale Construction Firms play a significant role

by offering employment to all classes of people (from the uneducated to the highly educated, skilled and unskilled personnel etc.). This makes it crucial for SSCF contractors to be established and be motivated to flourish and continue to offer jobs to millions of people in the Ghanaian communities.

According to the UNCHS (1996), Small Scale Construction Firms, particularly those in the construction sector play key roles in the development of other sectors of the economy including agriculture, manufacturing, and education. Thwala and Phaladi (2009) summarize the roles of Small Scale Construction Firms in the following:

1. The relatively low skills, experience and the capitals needed to set up small scale contracting enterprises make it easier for all categories of people to enter.
2. Small scale contractors have outstanding abilities of being able to carry out small projects in different and isolated locations that may not be attractive to larger firms.
3. The presence of Small Scale Construction facilitates quick expansion and reallocation of wealth across the country.
4. Small Scale Construction firms in the context of the construction sector serve as avenues through which thousands of jobs created for the people and thereby reducing the spate of unemployment in Ghana.

Many small scale contractors carry out their work in the formal and informal sectors, with those in the formal sector having formal relationships with their clients than those in the informal sectors (Kheni *et al.*, 2008). According to Berry (2002) and Laforet and Tann (2006), the proximity of the customers to Small Scale Construction firms help them to adapt to the prevailing conditions and become agile in its competition whether the Small Scale Construction firms are in formal or informal construction. Furthermore,

Small Scale Construction firms are entrepreneurial in nature and market oriented however; Small Scale

Construction firms are highly susceptible to threats in the business or construction environment. The dynamic role of construction small scale contractors cannot be downplayed especially in the developing countries; Small Scale Construction firms in the construction industry are seen as the avenue or enforcers of growth in the economy (EurActiv, 2009). A key indicator of booming economy is a vibrant Small Scale Construction firms especially enterprises in the construction arena. Statistics in Ghana have shown that, about 49% of the country's GDP in 2012 was generated from small and medium scale firms including the construction sector (Ghana Statistical Services, 2013).

The activities of small scale contractors in the construction sector of Ghana is very useful in encouraging development in rural communities through the support of government, donor agencies towards poverty alleviation and improving the living condition of inhabitants. The low requirement of entry as well as the demand for their services commands the dominance of small scale contractors in the construction sector of Ghana.

2.3 Overview of Construction Planning Tools and Techniques: The Ghanaian Perspective

Problems arise in all construction projects. It ranges from difficulty in planning to the post construction period. Moreover, the project in itself is a problem. These problems put management in a fix to look for survival (Maserang, 2002). Identified problems on the construction project and the strategies in addressing them become fundamental to

an organizations ability to adjust to changes in the business environment. People are put in charge to address these identified problems in the organization (Adams, 1997).

Though the basic concepts of project planning including that of the construction sector are simple, but applying these concepts to an existing organization is not an easy task (Maserang, 2002). Tasks in construction projects require tools and techniques which are designed to function in a project and its life cycle (Adams, 1997). Planning tools and techniques in construction becomes the function from which the master plan of a project developed by management is realized before project schedulers' assigned time and resources. It is also referred to as project scheduling (Maserang, 2002). Planning in construction helps in considering the naughty and successful experience of old projects in future projects to produce a desirable result as it act as a precaution aiding construction managers to reduce unfavorable effects or unanticipated happenings. Construction planning tools and techniques eliminates confusion, waste, and loss of efficiency thereby increasing the chances of a successful project delivery (Manye, 2015).

2.4 The Adoption and Usage of Construction Planning Tools/Techniques in Ghana

Every construction project requires effective planning since it is fundamental to the realization of the success of the project. Construction planning includes the technology to be employed on a project, the definition of scope of works, the resources required for the execution of the project, the duration of individual activities and the project duration as well as addressing all conflicting issues associated with planning of the project (Doyle, 2007). Though the objectives of the projects are set before the execution of the project implying that, the basis of a project is dependent on the planning done. Planning in construction is recognized to be the most effective and efficient way of

handling the complexities in connection with construction projects as project participants and organizations to be included in the project are well outlined (Doyle, 2007). The ability to enhance organizational performance is believed to be inside the adaptation of a well-defined construction plan through the application of the construction planning tools and techniques (Manye, 2015).

In Ghana, planning as an aspect of construction project management has gained prominence and it is consequently applied in the public and private organizations for an effectual project delivery. Nevertheless, there is a reverse of the aforementioned; though private construction firms within the country are envisage to be efficient and effective in the delivery of construction projects as a result of the gradual application of the construction planning tools and techniques, whereas the public construction firms are yet to catch up with this wind of change (Manye, 2015). Again, it is realized that, even though the private construction firms are doing better than the public construction firms in Ghana in terms efficient and effective project delivery, the application of these tools as well as the techniques in both firms are comparatively at a very low level (Manye, 2015). Manye (2005) attributed the cause to the following major obstacles:

a) Lack of professional experience
b) Project management knowledge
c) Rigid organizational structure

2.5 Construction Planning in Small Scale Construction Firms

It is an established fact that, Small Scale Construction Firms are organizations with their employee size falling under pre-defined category. Furthermore, it can be owned and run by an individual, corporate bodies, families and their business of operation can run from architecture to manufacturing. Conversely, the thresholds in terms of

employees differ from country to country and even group of associations across the globe (Aquil, 2013). Management of Small Scale Construction Firms in the construction industry refers to the process of accomplishing construction objectives making efficient use of construction resources. It has been stated earlier about the importance of Small Scale Construction Firms to the economic growth of nations. In the same vein it is recommended that Small Scale Construction Firms step up their game by becoming competitive and provide quality services because they are underperforming especially in the construction industry. Construction management which employs project management principles like project plans significantly contribute to the adaptability and growth of organizations however, it designs and scope is based on the needs of the individual organization. Construction planning includes the activities involved in generating activities, analyzing the impacts of these activities, deciding how these activities are carried out among other alternatives (Doyle, 2007). Planning is a well-organized activity defining the tools and techniques required to implement a specific task in construction projects. However, construction planning tools as well as its techniques was initially used in the heavy engineering industries as Morris (1994) reported. Ghobadian and Gallear (1997) proposed the some striking features distinguishing SSCF from LSCF based on the planning aspect of construction management include the following:

a. Processes – Small Scale Construction Firms does not necessarily follow a structured or formal evaluation of the project scope. It has a simple planning and control systems unlike LSCF
b. Procedures – The degree of standardization is on a lower side and such is based on individual experience.

c. Structure – employees within the organizations are multi-tasked and there is little avenue for specializations however, geared to innovativeness.
d. People – The inability of Small Scale Construction Firms to make head ways has resulted in people using tried and tested techniques.

Small Scale Construction Firms should follow a structured process drawn according to a given construction project plan by identifying the strategic objectives of the project and appropriate success criteria as well as key performance indicators for their projects. Accordingly, appropriate success factor as well as appropriate planning tools and techniques that meet the criteria outlined above should also be followed. Small Scale Construction Firms need construction planning tools to manage their innovativeness in a focused manner, and to achieve growth and satisfy their strategic objectives in a way that minimizes the high-inherent risk (Owens, 2006; Ledwith, 2004). According to Owen (2006), Small Scale Construction Firms are challenged with monitoring and controlling as well as their inability to define a project scope because there are no formal structures and systems for such purposes. Construction planning in the Small scale contractors should conform to the principles outlined by Ghobadian and Gallear (1997) as listed above. Most Small Scale Construction Firms in the construction sector provide simple planning and informal evaluation reports which must be usable to everyone within the organization and must also support the idealistic decision making. Consequently, Small Scale Construction firms are required to have a version of a well-defined project plan which is less bureaucratic than the traditional versions designed for large engineering projects, and less bureaucracy than some recent versions designed for medium-sized projects (Office of Government Commerce, 2005).

2.6 Construction Planning Tools/Techniques

Planning is a comprehensive activity undertaken by management of organizations whether Small Scale Construction firms or Large since it accommodates the activities from the inception of the project to the commissioning of the project. Key activities concluded on at the planning stage of the project includes technological basis for the projects, scheduling of the project, controlling, monitoring and evaluating systems as far as the realization of the project objectives are concered (Bakouros and Kelessidis, 2000). The importance of the planning process enables management to effectively plan, organize resources and execute the project with control mechanisms which contributes to the success of the project. An organization that fails to plan exposes itself to the threats within both the internal and external environment of the project. Human resource, financial, equipment and tools, project information, techniques are the known resources for construction projects. The project will be in limbo when there is absence of resources this make resource an inevitable part of the project. Therefore, allocation of resources is crucial to the project and requires a systematic procedure. According to Meredith and Mantel (2009), application of project management tools and technique helps the project manager to structure the project towards achieving the overall objectives of the project.

As a project progresses through the consecutive life cycle in the construction sector, more project information becomes available helping in decision making by project teams. The project planning tools and techniques are often used by project managers to analyze and process project information (Zanen and Hartmann, 2010). In the early stage of a project, project tools and techniques support the creation of project strategies, scheduling tasks, and the organization of the project team and project resources. In the latter part of the project, practitioners use tools and techniques for project monitoring

and control purposes (Zanen and Hartmann, 2010). Meredith and Mantel (2009) asserts that, construction planning incorporates skills, techniques, tools and processes which all construction projects follow. Planning construction projects now involves overcoming many complications (Kerzner, 2009) including the complexity of the project, the project risk, the client requirements as well as organizational restructuring. It is therefore vital to have systematic structures or tools and techniques to help account for obstacles and how to overcome them to ensure success of the project. Kerzner (2009) outline some of the functions of planning in perspective of construction projects as follows:

a. The identification of functional responsibility to ensure accountability of all activities;
b. The identification of deadlines and milestones on the project;
c. Evaluating the progress of work accomplished as against planned duration of work;
d. Assessing risks inherent in the project at an early stage; and
e. Estimating on project to ensure its credibility and at least same as the actual.

Although construction planning is a tedious work involving a number of complicated responsibilities, there exist many tools and techniques to assist in planning projects so as to accomplish the tasks and execute these responsibilities (Maserang, 2002). Some of the tools demand computer supporting software, but others are done manually. The management style of the construction firms in Ghana requires planning tools and techniques which better suit, having in mind that project management is still on its early stages in Ghana. The construction planning tools including its techniques which are normally used are the Program Evaluation Review Technique (PERT), Gantt Charts,

Work Breakdown Structure (WBS), Cost Breakdown Structure (CBS), Critical Path Analysis (CPA), Resource Histogram (RH), Gates and milestones (G&M), Reports etc. (Maserang, 2002).

- **Program Evaluation Review Technique (PERT)** – it is designed to define and control all the necessary tasks required for enabling of the successful completion of the project; this makes it an effective and efficient planning tool (PMT, 2002). The following has been outline as the steps for PERT planning:
  a) Activities of the project are identified as well as the milestone
  b) The proper or logical sequence of all identified activities are determined
  c) A network showing the overall activities are shown in a network diagram
  d) Duration for each activity are estimated
  e) Critical path activities in the network are determined
  f) The progress of the project is then updated on the PERT chart regularly

PERT aids in identifying interrelationship between different tasks or activities; it is also used as a good communication and planning tool for time management (PMT, 2002).

1. **Gantt charts** – it is the presentation of horizontal bars to show activities involved in a project. Each bar represents an activity and the performance of the project can be estimated as well as the progress of the work. All activities on the chart can show the overall process of the project, helps in allocating resources to the various activities, track project estimates and can help in the coordination of the project. In simple terms, it represents the time table for the projects which can help management to monitor the progress of the project (PMT, 2002). It is very easy and simple to understand which does not need any expertise to interpret its meaning.

2. **CPA** – Although the Gantt chart is known to be an important by showing activities graphically however, it is not an excellent tool for complex and lengthy project. Mega or complex projects tend to have many activities interdepending on the other. For instance, some activities need others to be completed before they can start whilst some need others to start before the can also start. According to Acorn (2012), Gantt chart is deficient in showing the interdependency of the various activities, therefore makes it redundant for the mega projects with activities depending on the other. CPA is a very powerful tool which shows the logical sequence of activities and the durations of activities and reveals the activities which are dependents on the other. Therefore, it is an essential and powerful tool for management of time and complex projects. Gantt charts serve as a valuable budgeting tool and can show dollars allocated versus dollars spent (PMT, 2002). The Gantt chart follow these sequence below:
    a) All activities in the project plan are listed.
    b) Daily and weekly to completion head up graph.
    c) Activities are plotted on a graph paper.
    d) Schedule activities.
    e) Presenting and analysis
3. **WBS** –Work Breakdown Structure (WBS) aids in effective planning of projects through breaking segregating into parts, major tasks. WBS provides a well-informed list of tasks to be performed for a project, helps to deliver better costing, scheduling and resource planning for a project. Work Breakdown Structure facilitates the sequencing of events to facilitate the manner in which time is allocated (Acorn, 2012).

4. **CBS –** cost breakdown structure (CBS) lists every item classified and its expenditure for the project in order to get a more detailed estimate of cost or expenditure. During a project, financial control can be achieved by actual expenditure being tracked against each budget allocated for the different tasks assigned (Acorn, 2012). Cost breakdown structure can be used as a basis of financial 'exception reporting' e.g. actual budget cost allowances, and also forecast more accurately the project costs.
5. **Resource histogram** – it is just like the Gantt chart but its represent resources assigned to various activities on a project. It is an effective tool for planning resources on a project and assigning human resources to activities on the (Acorn, 2012).
6. **Gates and milestones** – milestones are a completion of major interim goals for a project e.g. the key stages of a project from initiation to closure. Gates on the other hand are significant events or major objectives that have been accomplished at various stages of a project. They assess the key completion or quality of work achieved (Acorn, 2012). Gates are smaller milestones, but well defined into the project management process, a firm deliverable that can be realized and achieved.
7. **Reports** – under this tool, there are three (3) different tools. **Project initiation document (PID)** is a report use for justifying a business case for a project, detailing the justification for undertaking it and for continuation of it. PID is used to define the financial and other benefits which the project is expected to deliver. It details the cost, timescale and other constraints within which the project is required to operate and against which performance will be evaluated (PMT, 2002). **Project planning document (PPD)** will normally consist of a

project technical and resource plan at the beginning of a project and used as a reference tool throughout the project. **Progress (or exception reports)** on the other hand is used to monitor and control the project; it allows the project board or project manager to identify cost, scheduling or quality related problems earlier, and view the current status of progress (Acorn, 2012).

2.6.1 The Role of Construction Planning Tools/Techniques in Project Success

As in the development of appropriate alternative tools and techniques for facility design, choices of these tools and techniques for construction are ill-structured yet they are very key ingredients in the success of a project. A decision between these two alternatives should take into consideration the relative costs, reliabilities, and availability of equipment for the planning tools and its techniques. Listed below by the researcher are the roles of these tools and techniques which are considered significant in the phases of construction project.

a. Planning techniques link project goals and objectives to stakeholder needs; it does focus on customer needs as well. It builds high-performance project teams and as well work across functional boundaries. Planning techniques develop Work Breakdown Structures as it gives the estimation for project costs and schedules, meet time constraints, calculate risks and also establish a dependable project control and monitoring system (Maserang, 2002).
b. The planning tools give easy understanding to visual display of the scheduled time of a task or activity; it makes it easy to develop “what if” scenarios; it enables better project control by promoting clearer communication; it a tool for negotiations; it shows the actual progress against the planned schedule; it report results at appropriate levels; it allows comparison of multiples projects to

determine risk or resource allocation; and it rewards the project manager with more visibility and control over the project (Maserang, 2002).

2.7 Barriers to the Application of Planning Tools and Techniques in Construction by Small Scale Construction Firms

Ihesiene (2014) added that, it is a universally accepted knowledge that the contribution of Small Scale Construction Firms towards national development is very important. Conversely, Small Scale Construction Firms performance has become a topic of interest since they are not living to their expectation, in other words, Small Scale Construction Firms are underperforming in the work environment. According to Safiriyu and Njogo (2012), it is observed that project management practices are effective in addressing the abysmal performance or failures recorded by Small Scale Construction firms. Actually, the problem is much felt in the implementation stage of the problem which eventually leads to project abandonment due to the absence of the requisite tools and techniques needed for the project. Below are some barriers identified from Small Scale Construction Firms with regard to the implementation of management of construction related projects and the application of construction tools and techniques towards the infrastructure delivery.

a) **Management problems** – Small Scale Construction firms are run by management, implying that management can contribute to the problems it is facing. For instance, poor leadership can hinder the use of planning tools in an organization, problems with financing the activities of the enterprise, interference by family and friends, politics at workplace and replacing organizational goals with personal ambitions. When an organization is not flexible as a result of the due diligence to organizational structures, it prevents

the organization from taking new initiatives which does not contribute to the growth of the organization (Ihesiene, 2014).

b) **Limited finance** – The major setback of most construction organizations are unavailability of resources like finance, this actually applies to all manner of firms whether Small Scale Construction Firmsor Large. Construction planning tools are Software based, which are purchased however this software are very expensive which becomes difficult for Small Scale Construction firms to procure because of their challenges in finance (Ihesiene, 2014).

c) **Limited project management (PM) knowledge** – most of Small Scale Construction firms problems are Project Management related. Though understanding the concept of project management is very essential and useful for the enterprise however, because PM is very bureaucratic nature, time and resource consuming it has become a burden on Small Scale Construction firms to spend all resources on the implementation PM principles in the organization.

d) **Environmental problems** – Projects are placed within the internal and external environment. Most at times, the influence on the project from the external environment becomes difficult to control by the stakeholders of the project. These include the influence of government agencies on the project such as permit and approval from various regulatory bodies, enforcement agencies and employment of unskilled labour from hosting communities. (Ihesiene, 2014). Furthermore, culture has influence on the project, unpleasant whether conditions, religion and other social related issues.

e) **Corruption –** According to Ihesiene (2014), the projects environment are fraught with irregularities and fraud. In reality these problems are encountered during the awarding of contracts stage where bribery becomes the order.

Moreover, fraudulent act from materials suppliers and fraudulent acts by workforce becomes an obstacle to large scale contractors how much more the small scale contractor. These challenges affect the contractor in terms of cost, time and delay.

f) **Labour mobility problems –**an important resource for construction firm is human resource. Though other resources are of utmost importance to the project however, the exploitation of these resources requires the service of qualified personnel. Contractors of late are involved in concurrent project which requires redeployment of personnel to projects however it creates problems for the personnel and the project at large (Ihesiene, 2014). Large contractors with adequate personnel can adequately function without challenges however; small contractors' inability to afford adequate personnel leads to delay in project.

g) **Awareness problems –** The concept of project management has emerged over time in the construction industry however, its integration into organizational policies has become an issue because organizations a conversant with the conventional ways of executing projects.

h) **Policy problems –**ideally, governments in developing countries are struggling with employment opportunities for their graduates since they lack the capacity to employ them. Therefore, governments rely on private businesses to address employment challenges. Conversely, according to Ihesiene (2014), policies formulated by governments have impeded the growth of these organizations especially small scale ones. In other vein, small scale organizations are struggling to penetrate the job market however government policies on tax, interest and inflation has become a major barrier to them.

2.8 Strategies to Enhance the Application of Construction Planning Tools/Techniques

The challenges and problems related to Small Scale Construction firms disposition to construction management including its tools and techniques vary and thus require urgent multifaceted and strategic methods to counter the disadvantaging side and as well enhance its application of planning tools and techniques in the delivery of construction projects. Since the presence of Small Scale Construction firms is known among the developing world, strategies have been proposed to help them master the management skills of planning on construction projects. Small Scale Construction firms cannot be eliminated from the economic contributors of a country. The under listed strategies can be adapted by Small Scale Construction firms in using the planning tools and techniques for its operations:

a. Construction planning tools and techniques ranges from simpler forms to sophisticated forms however, the choice of a specific one is dependent on the scope of project and the caliber of organization involved. The survival of Small Scale Construction firms requires the support and contribution of government, therefore it behooves on government to encourage professional bodies or establish them through an Act of Parliament to help develop and equip construction Small Scale Construction firms or regulate management practices of them.
b. Most governments have a ministries dedicated for infrastructure development. Government should therefore, adequately fund these ministries to mentor these Small Scale Construction firms to sharpen their skills from planning to the operation stage of projects. It is crucial for government because most infrastructure developments are procured by government. Alternatively,

government can collaborate with professional bodies to organize training, seminars and workshop sections for the Small Scale Construction firms.

c. The legal framework of sole proprietorship should be reviewed to separate ownership from management of the organization. Most Small Scale Construction firms full in the category of sole proprietorship and a major setback to their operations is finance. Owners are overburdened due to difficulty in accessing financial support from financial institution.

d. Moreover, ministries to oversee the performance of private organizations in the country and should provide guidelines articulating how Small Scale Construction firms can implement their projects. Furthermore, Monitoring units within these ministries should ensure that these workable steps are followed by the Small Scale Construction firms.

e. The introduction of Project Management has revealed different shades of acclaimed project managers. A noble profession of such nature requires qualified and credible individuals; governments are therefore entreated to formulate laws which prevent uncertified project managers from acting as such on projects. Alternatives, such roles should be occupied by graduates with the technical know-how in the Project Management discipline.

f. Small Scale Construction firms are deficient in project planning tools and techniqs practices, therefore Small Scale Construction firms should collaborate with project managers for assistance in the implementation stage of their projects.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

To come out with concrete findings and facts concerning the application of the construction planning tools and techniques by Small Scale Construction firms in Ghana, this chapter looks into the procedures adapted in the realization of the aim of the study. Also this chapter stresses on the research design, research method questionnaire design, sampling method and size, how data is collected and prepared for analysis. This research design is to address the research problem and also serve as an outline to provide answers to the research question. The research method also emphasizes how questionnaires are designed, the scope of the research, sampling size and analysis of data.

3.2 Research design

It encompasses an exhaustive procedure and processes for the study including the research approach and strategy for the study. The design strategy for this study is a quantitative in nature. This strategy was adapted because the research seeks to narrow the study to the application of construction planning tools and techniques by Small Scale Construction Firms (SSCF)in Ghana. The nature of this study is deductive because it seeks to draw conclusions on the application of the best practices of construction planning tools and techniques by Small Scale Construction firms from which appropriate statistical tools are used to results findings, draw reasonable conclusions and make final recommendations. In view of this, questionnaires were designed to serve as a means to seek for the opinions of construction professionals such as project managers, site managers and engineers concerning the construction planning

tools and techniques most frequently adopted by SSCF in Ghana, the challenges associated with the adoption of these planning tools and techniques by the Small Scale Construction firms in the Ghanaian construction industry and the strategies to enhance the application of construction planning tools and techniques of construction planning tools and techniques by Small Scale Construction firms in Ghana.

3.3 Data Sources

The researcher employed primary sources of data. The aim is to gather the required information that can be analyzed, to enable interpretation, and aid the investigator to grow unique information such as eye witness accounts, and personal observations.

3.3.1 Population and Sample Size

D3K3 contractors in the Greater Accra and Ashanti regions precisely Accra Metropolis and Kumasi Metropolis form the population of the study because they fall in the Small Scale Construction firm's category. These classes of contractors were chosen on the basis that they constitute the majority of construction companies in the country. Furthermore, they are predominantly visible in the main cities such as Kumasi and Accra, since major construction activities are undertaken in such jurisdiction because of high demand of housing units. According to the Ministry of Water Resources, Works and Housing, D3K3 contractors execute works within the threshold of two hundred thousand dollars (USD 200,000). Ideally, small scale contractors comprise of D3K3 and D4K4. However, the study focused on contractors registered with the Association of building and Civil Engineering contractors of Ghana (ABCECG).

According to ABCECD, D3K3 Contractors are the small scale contractors registered with the association with good standing, therefore, the study limited itself to D3K3

contractors. Statistics from of ABCECG indicates that, the total number of D3K3 contractors in Ashanti with 36 registered members and Greater Accra region with 44 registered members making a total of 80. The population for the study was then concluded to be 80. Given the accuracy of the results required and the manageable size of the population, a census was conducted. As such, the entire population was used for the study.

3.3.2 Sampling Technique

As stated by Saunders et al., (2012), given the manageable size of some populations, it is possible to collect data from the entire population and that sampling is only done when it practically impossible to study the entire population. As such, given the manageable size of the population, all the eighty (80) contractors registered for the study were contacted and questionnaires were administered to them individually. Thus a census was used and therefore no sampling technique was used. Each firm was assigned with a questionnaire, meanwhile project managers, site manages and engineers were the ultimate respondents for the study.

3.4 Questionnaire Design and Development

Questionnaires were developed to be simple and easy to understand thereby making it friendly to the respondents to facilitate the involvement of a lot and in consequence maximize the response rate. The questionnaire was designed using plain language devoid of 'technical' words, except where used it was explained to the respondents. Aside the plain language, the questionnaire was deliberately designed to include close-ended questions. The layout and format of the questionnaire were carefully considered as they impact on the response rate. Instructions were given at the beginning of every major part for filling the questionnaire. The questionnaire was in two main sections,

Parts A and B. The Part A focused primarily on the demographics of the respondents and as such requested the background information of the respondents. Studies have demonstrated the significance of demographic variables or background information, particularly in quantitative studies.

The Part B was anchored on the research objectives and as such was based on the literature review in regards to construction planning tools and techniques most frequently adopted by Small scale contractors in Ghana, the challenges associated with the adoption of these planning tools and techniques by the Small Scale Construction firms in the Ghanaian construction industry and strategies to enhance the application of construction planning tools and techniques by Small Scale Construction firms in Ghana.

3.5 Data Analysis

Checks like completeness of the retrieved questionnaires were done and coded for further analysis through the help of the Statistical Package for Social Scientist (SPSS). The descriptive statistics was used for analyzing the collected data and presenting them in tabular forms. Data about the background information of respondents were presented in frequency distribution tables which were discussed to deduce its influence on the study. Furthermore, the Relative Importance Index (RII) using the Microsoft Excel software was used to identify the importance of the challenges associated with the adoption of these planning tools and techniques by the Small Scale Construction firms in the Ghanaian construction industry (Badu *et al*., 2013). The Relative Importance Index determines the importance or significance of a factor in relation others measuring the same construct. The RII is calculated using the formula:

Relative Importance Index (RII) = $\frac{\sum W}{AN}$

Where, W = weights given to each factor by the respondents and ranges from 1 to 5, where ‘1’ is very low and ‘5’ is very high.

A = the highest weight (i.e. 5 in this study)

N = the total number of respondents

Mean Score Ranking (MSR) was also used to compare sample mean to the known population.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION OF RESULTS

4.1 Introduction

In inference with the introduction, relevant literature reviewed and the research methodology described, this chapter now introduces the analysis of data and discussion of results. It discusses respondents' views on the identification of construction planning tools and techniques most frequently utilized in the Ghanaian construction industry, the challenges associated with the adoption of these planning tools and techniques and strategies to enhance the application of these construction planning tools and techniques in Ghana. The analysis saw the adoption of simple descriptive statistics, mean score rankings and the Relative Importance Index. After running the analysis, the results are then shown in tables and figures.

The questionnaire developed for the study was administered to eighty (80) contractors however, seventy-three (73) responded to the study. Indicating a response rate of 91.25%, this is a strong indication that the contractors are interested in the study. Moreover, it can be traced to the constant follow-ups by the researcher on the respondents. Subsequently, considering the deletion of outliers and missing values due to incomplete data, it was noted that all the 73 completed questionnaires were considered valid for the analysis. All the retrieved questionnaires formed the basis of the analysis done in this section and discussions made for the purpose of this study are solely based on the retrieved questionnaire.

4.2 Descriptive Analysis of Data (Demography)

The demographic information part of the questionnaire is analyzed in this section of the study. Information regarding the professional background of respondents were sought,

experience of respondents in their respective organizations as well as the construction industry at large. Apparently, the conclusion made on the later part of the source can be limited to the caliber of personnel involved in the study; this makes it very important to understand the professional make-up of the respondents.

4.2.1 Professional Background of the Respondent

Table 4.1 shows the role of the respondent in the organization. Roughly, 5.5% were Quantity surveyors (N = 4), 32.9% were contractors (N = 24), 37% were project managers (N = 27), 5.5% were civil engineers (N = 4), 19.2% were site managers (N = 14). The respondent position is vital to ensure some degree of reliability of the data. The high representation of project managers, contractors and site managers was inevitable as these professionals are very key and usually engage in the planning of construction activities. This makes them credible and reliable source of information which is needed for this study.

Table 4.1: Professional background of the respondents

	Frequency	**Percent (%)**
Quantity Surveyor	4	5.5%
Contractor	24	32.9%
Project Manager	27	37.0%
Civil Engineer	4	5.5%
Site Manager	14	19.2%
Total	**73**	**100.0%**

Source: Field Survey, 2016

4.2.2: Length of Experience of Respondents in their Sector

Respondents work experience is presented in table 4.2. Roughly, one-third of the respondents indicated they have been the organization for between 6 to 10 years; representing 45.2%, different group of approximately 19.2% have varied experience of 11 to 15 years in the organization. 26% of the respondents have worked for over 16 years and 9.6% have less than 5 years' work experience in the organization. Averagely, most of the respondents have been practicing within the last six (6) years in the construction industry which important to the study since it reveals the credibility and reliability of the results for the study. In a society where promotion and appointment to management of organizations are based on the years of experience an individual has had with the organizations, then all things being equal, the facts that many of the respondents in the contractors organizations have spent an average of six (6) years suggest that, the respondents have been involved in making decisions on planning of construction activities and construction management in general.

Table 4.2: Length of Experience of Respondents in their Organization

	Frequency	**Percent (%)**
Less than 5 years	7	9.6%
6 to 10 years	33	45.2%
11 to 15 years	14	19.2%
Above 16 years	19	26.0%
Total	**73**	**100.0%**

Source: Field Survey, 2016

4.2.3: Length of Experience of Respondents in the Construction Industry

The experience of an individual in an organization cannot be directly proportional to the person's experience in an industry because there might be the probability of jumping jobs. It is based on that the study sought information on respondents experience in the construction industry. Furthermore, this information will contribute to the study by getting quality information from respondents. From the table, bulk of the respondents have been in the construction industry for more than 15 years representing 86.3% (N = 34.2+52.1). Approximately, 8.2% and 5.5% indicated level of 6 to 10 years and Less than 5 years' experience in the construction industry. Consequently, it can be concluded that most of the respondents have experience in the construction industry and as a matter of fact, they are in the position is provide their in-depth experience on the subject of the study. Furthermore, the experience within the various categories is a tool in providing the study with varied views from respondents as far as the study is concerned.

Table 4.3: Length of Experience of Respondents in the Construction Industry

	Frequency	Percent (%)
Less than 5 years	4	5.5%
6 to 10 years	6	8.2%
11 to 15 years	25	34.2%
Above 16 years	38	52.1%
Total	73	100.0%

Source: Field Survey, 2016

4.3: Tools and Techniques for construction planning

Respondents were asked to identify construction planning tools that are widely recognized in their organization. From table 4.4, not surprisingly, respondents indicated

some level of awareness of all the planning tools and technique however, Gantt Charts, Work breakdown structure (WBS), Cost breakdown structure (CBS), Critical path analysis (CPA), Resource histogram (RH) and Training Programmes were found to be the most famous construction planning tools and techniques that are utilized in the construction industry. This clearly indicates that, the level of awareness of construction planning tools in the construction industry is still on the edge of improvement by small and medium firms. This as Ghobadian and Gallear (1997) described is as a result of the process, procedures, structure and the people in the planning of construction activities.

Table 4.4: Construction planning tools and techniques

Planning tools	Frequency	Percentage (%)
Gantt Charts	9	12.33%
Work breakdown structure (WBS)	12	16.44%
Cost breakdown structure (CBS)	10	13.69%
Critical path analysis (CPA)	11	15.07%
Resource histogram (RH)	5	6.85%
Gates and milestones (G&M)	3	4.11%
Training Programmes	6	8.22%
Impact Assessment Technique	2	2.74%
Stage Gate Process	1	1.37%
Schedule crashing	3	4.11%
Decision tree analysis	1	1.37%
Option evaluation chart	1	1.37%
PERT – Program Evaluation Review Technique	4	5.48%
Network Analysis	5	6.85%
Total	**73**	**100%**

Source: Field Survey, 2016

4.3.1: Application of Construction Planning Tools and Techniques

On the quest of determining whether or not firms apply these construction planning tools and techniques in their construction implementation, majority of the respondents

approximately 47% indicated that they neutrally utilized these planning tools in their operation. While, 45.2% of the respondents indicated that they often employ these construction planning tools and techniques in their operation and 6.8% apply these planning tools very often. Irrespective of the awareness of these construction planning tools, majority of the respondents apply these tools in their operation.

Table 4.5: Application of Construction Planning Tools and Techniques

	Frequency	**Percent (%)**
Very Often	5	6.8%
Often	33	45.2%
Neutral	35	47.9%
Total	**73**	**100.0%**

Source: Field Survey, 2016

4.3.2: The Extent of Utilization Construction Planning Tools and Techniques

In an attempt to determine the extent of utilization of construction planning tools and technique in their various organization, respondents were asked to rate them according to the extent of usage on a five-point Likert scale items. The adopted scale read as follows, *5= very high; 4= high; 3 = intermediate; 2 = low; 1= negligible*.

In analyzing the results of the extent of utilization of construction planning tools and technique in their various organization, the mean score ranking was used. From table 4.6 below, it is interesting to see that all the planning tools and techniques that were gathered from literature, the respondent responses indicated that all the tools are been utilized in the industry and are very influential. However, taking tools in order of relevance and most employed in operation, the most commonly used planning tool, as indicated by respondents, are Critical path analysis (CPA), Work breakdown structure (WBS), Network Analysis, Training Programmes, Gantt Charts, Cost breakdown

structure (CBS), Resource histogram (RH) and PERT – Program Evaluation Review Technique. These planning tools had a mean score value and a standard deviation value of more than 4.0 and less than 1.0 respectively. This is a clear indication that, complex planning tools and techniques are more expensive and complicated for small and medium firms to invest in. consequently, the minimum level of skills and training required to implement these.

Table 4.6: The Extent of Utilization Construction Planning Tools and Technique

No.	Planning Tools	Mean	Std. Deviation	Ranking
1.	Critical path analysis (CPA)	4.73	.692	***1st***
2.	Work breakdown structure (WBS)	4.68	.468	***2nd***
3.	Network Analysis	4.64	.562	***3rd***
4.	Training Programmes	4.59	.723	***4th***
5.	Gantt Charts	4.51	.580	***5th***
6.	Cost breakdown structure (CBS)	4.41	.495	***6th***
7.	Resource histogram (RH)	4.26	.727	***7th***
8.	PERT – Program Evaluation Review Technique	4.14	.976	***8th***
9.	Gates and milestones (G&M)	3.90	.853	***9th***
10	Schedule crashing	3.78	.731	***10th***
11.	Impact Assessment Technique	3.71	1.184*	***11th***
12.	Decision tree analysis	3.32	1.026*	***12th***
13.	Option evaluation chart	3.08	.662	***13th***
14.	Stage Gate Process	2.63	.565	***14th***

Source: Field Survey, 2016

Planning tools has made it efficient and more reliable for firms to employ. As Morris (1994) reported, complex planning tools and techniques were initially used in the heavy engineering industries. Owen (2006) added that, due to the inadequate funds to embark

on effective and efficient planning tools and techniques as well as system in place to monitor and control project, they have ill-defined project plans. Hayford and Sarfraz (2013) opined that, only time among the three major project constraints would be tracked in the projects in small and medium firms when they embark on simpler tools like Gantt Charts and the like. All the other planning tools also had a mean value of greater than 3.0. However, Impact Assessment Technique and Decision tree analysis which had a mean value of 3.71 and 3.32 respectively had a standard deviation value greater than 1.0. This indicates that, there might be differences as to how respondents understood the usage of these tools.

4.4: Challenges Associated with the Adoption of these Planning Tools and Techniques

Further, it deemed crucial and overbearing to pinpoint the challenges associated with the adoption of these planning tools and techniques in the Ghanaian construction industry. From literature, eight (8) challenging factors were identified and respondents were asked to rate them to indicate the level of influence of each challenging factor associated with adoption of these planning tools on the scale on a five point Likert scale. In the analysis of the level of influence of the various planning tools, the Relative Important Index (RII) was used.

From table 4.7 below, Management problems was ranked first (1^{st}) with a mean and an RII value of 4.56 and 0.912 respectively. According to Ihesiene (2014) management problems relating to over bearing owner-financier influences, family interferences, poor organizational leadership, and lack of strategic planning, lack of initiatives, workplace politics, and alignment of organizational goal to owner personal goals are major influences that affect the planning of construction activities. Consequently, the organizational structure of some firms becomes a challenge in the application of

construction planning tools and techniques in the initiation, planning, execution, and handover phases of the construction project (Ihesiene, 2014). Limited project planning knowledge was rated second (2^{nd}) with a mean and an RII value of 4.30 and 0.860 respectively. The project management knowledge gap problem in connection with project planning is a challenge in the planning of construction activities. The myths include; small enterprises should employ PM since it is necessary for their operations, PM practices are specialized in nature, it consumes time and very bureaucratic nature, it becomes a major administrative burden, retards the growth of organizations and finally capital intensive in nature. These extend to poor knowledge of projects nature and lack of historical documentations about closed projects (Ihesiene, 2014). Awareness problems, Policy problems and Limited finance was ranked third (3^{rd}), fourth (4^{th}) and fifth (5^{th}) with a mean and an RII value of 4.22, 3.70, 3.41 and 0.844, 0.740, 0.682 respectively. According to Ihesiene (2014), awareness problems refer to the issues that hinder acceptance, adoption and diffusion of PM innovative practices such as lack of sufficient PM awareness, dearth of opinion leaders and PM success references. Limited finance includes issues relating to prohibitive cost of PM software and supporting ICT infrastructure, PM skill acquisition, cost of engaging PM experts, and inability to secure sufficient facilities from banks for projects hinders the implementation of construction planning tools and techniques.

Table 4.7: Relative Importance Index of the Challenges Associated with the Adoption of these Planning Tools and Techniques

No.	Challenges	Mean	RII	Ranking
1.	Management problems	4.56	0.912	***1st***
2.	Limited project planning knowledge	4.30	0.860	***2nd***
3.	Awareness problems	4.22	0.844	***3rd***
4.	Policy problems	3.70	0.740	***4th***
5.	Limited finance	3.41	0.682	***5th***
6.	Labour mobility problems	2.34	0.469	***6th***
7.	Environmental problems	1.93	0.386	***7th***
8.	Corruption	1.85	0.370	***8th***

Source: Field Survey, 2016

4.5: Strategies to enhance the application of construction planning tools and techniques

Table 4.8: Mean Score Ranking of the Strategies to enhance the application of construction planning tools and techniques

No	Strategies	Mean	Std. Deviation	Ranking
1.	Ensuring qualified construction planning personnel on construction projects	4.92	.363	***1st***
2.	Policy reforms with regards to financial support and training Programmes for firms and staffs	4.52	.689	***2nd***
3.	Government policy that mandate relevant agencies to champion Small Scale Construction Firm re-orientation towards utilization of construction planning in their operations	4.18	.822	***3rd***
4.	Collaboration during construction	3.97	.645	***4th***
5	Restructuring of construction planning methodologies	3.70	.893	***5th***

Source: Field Survey, 2016

To determine the strategies to enhance the application of construction planning tools and techniques, the mean score ranking was used. From the table above, ensuring qualified construction planning personnel on construction projects was ranked first (1^{st}) with a mean value and standard deviation of 4.92 and .363 respectively. Policy reforms with regards to financial support and training Programmes for firms and staffs was ranked second (2^{nd}) with a mean value and standard deviation value of 4.52 and .689 respectively. According to Hayford and Sarfraz (2013) adequate fund from the Government and mandating relevant agencies such as National Orientation Agency to champion small and medium re-orientation towards utilization of construction planning in their operations. However, this could be carried out through seminars, symposia, conferences, and site visitations. This factor had a mean and a standard deviation value of 4.18 and .822 respectively. Thus, this would go a long way to impact on the achievement of construction project objectives by firms. Collaboration during construction and Restructuring of construction planning methodologies appeared fourth and fifth with a mean and standard deviation value of 3.97, .645 and 3.70, .893 respectively.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATION

5.1 Introduction

Construction planning is an integral part of any increase quality project delivery and fundamental to achieving any project outcome as Hayford and Sarfraz (2013) advocated. It is undoubted evidence that construction planning process or approaches requires tools and techniques irrespective of the whole process steps, details or the level of undertakings in the various planning process. While there are a number of well-established tools and techniques employed for planning construction activities in large organization, yet small and medium enterprises are weak in areas of initiating the project, planning and execution of project (Ledwith, 2004). Thus, the aim of the study was to investigate into the application of construction planning tools and techniques by Small Scale Contractors firms in the Ghanaian construction industry. Previous chapters have presented the study, reviewed related literature on the study and data collected analyzed. This chapter is keen to succinct the findings of the study and drawing conclusions in that respect. How the various objectives were attained is returned to, limitations of the study are pointed and recommendations put forward. The ensuing sections show these:

5.2 Summary of Findings

This research was conducted with the primary aim of investigating into the application of construction planning tools and techniques by Small Scale Contractors firms in the Ghanaian construction industry. In pursuing this aim, three objectives were set out. The achievement of each of the three research objectives is set out in the following subsections.

5.2.1 Construction planning tools and techniques most frequently adopted by Small Scale Contractors in Ghana

Accordingly, from literature about fourteen (14) construction planning tools and techniques were identified but it was not surprising that, respondents indicated some level of awareness of all the planning tools and technique however, Gantt Charts, Work Breakdown Structure (WBS), Cost Breakdown Structure (CBS), Critical Path Analysis (CPA), Resource Histogram (RH) and Training Programmes were found to be the most used construction planning tools and techniques that are utilized in the construction industry. Which clearly reviews that the level of awareness of construction planning tools in the construction industry is still on the edge of improvement by Small Scale Construction Firms. Further, with the extent of utilization of the planning tools and techniques in the various organization, only simpler tools and techniques that requires less training to use were employed. This is a clear indication that, complex planning tools and techniques are more expensive and complicated for small Scale Construction Firms to invest in. consequently, the minimum level of skills and training required to implement these planning tools has made it efficient and more reliable for firms to employ.

5.2.2 Challenges associated with the adoption of these planning tools and techniques by the Small scale contractors in the Ghanaian construction industry

This objective was tackled by expressly reading existing literature on the Challenges associated with the adoption of these planning tools and techniques by the Small scale contractors in the Ghanaian construction industry. From literature, Eight (8) factors were identified and respondents were asked to rate them to indicate the level of influence of each challenging factor associated with adoption of these planning tools.

From responses, Management problems, Limited project planning knowledge, Awareness problems, Policy problems and Limited finance were the major challenging factors that hinder the adoption of these planning tools and techniques by the Small scale contractors in the Ghanaian construction industry.

5.2.3 Strategies to enhance the application of construction planning tools and techniques

Subsequently, respondents were asked to indicate the level of significance of the strategies that can be employed to enhance the application of construction planning tools and techniques. Respondents indicated that, ensuring qualified construction planning personnel on construction projects, Policy reforms with regards to financial support and training Programmes for firms and staffs and Government policy that mandate relevant agencies to champion Small scale contractors re-orientation towards utilization of construction planning in their operations to be the most important strategic factors to enhance the application of construction planning tools and techniques.

5.3 Conclusion

The study investigates into the application of construction planning tools and techniques by Small scale contractors in the Ghanaian construction industry. This comprised of a questionnaire survey with the respondents being construction personnel involved in construction planning. Construction planning tools and techniques utilized in the construction industry were identified and formulated into questions to the respondents. Among top ranked planning tool and techniques include Gantt Charts, Work Breakdown Structure (WBS), Cost Breakdown Structure (CBS), Critical Path Analysis (CPA), Resource Histogram (RH) and Training Programmes. However, in terms of its utilization, Critical Path Analysis (CPA), Work Breakdown Structure

(WBS), Network Analysis, Training Programmes, Gantt Charts, Cost Breakdown Structure (CBS), Resource Histogram (RH) and PERT – Program Evaluation Review Technique were the most employed tool in the order of importance. Key findings in this research however is that, respondents indicated that organizations embarked on only simpler tools, and tools that requires less training to use. Further, it was revealed that Management problems, Limited project planning knowledge, Awareness problems, Policy problems and lack of finance really impact the efficiency and the effectiveness of employing construction planning tools and techniques among Small Scale Construction Firms in the Ghanaian construction industry.

5.4 Recommendations

In view of the findings of this research, the following recommendations are therefore prescribed to enhance the application of construction planning tools and techniques in the Ghanaian construction industry.

1. It is relevant that construction professionals should have some level of formal education which integrates the use of construction planning tools and techniques, or otherwise organization should employ the services of certified construction planning professionals to undertake construction planning. Thus construction tertiary institutions should inculcate the use of construction planning tools and techniques in their curricular to enhance the planning capabilities of Small Scale Construction Firms engaged in the construction industry.
2. Since the Private Sector in Ghana contributes to Gross Domestic Product, then it is recommended that, government through its Ministry of Trade and Industry in collaboration with the Ministry of Water Resource, Works and Housing

should undertake training programmes for SSCF in Ghana as a means of boosting their performance.

3. A strong policy that prohibits noncertified project managers/planners from handling project must be enacted.

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APPENDIX

SURVEY QUESTIONNAIRE

AN INVESTIGATION INTO THE APPLICATION OF CONSTRUCTION PLANNING TOOLS AND TECHNIQUES IN THE GHANAIAN CONSTRUCTION INDUSTRY

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI

COLLEGE OF ART AND BUILT ENVIRONMENT

Department of Building Technology

(MSc. Construction Management)

Dear Sir/Madam

Many thanks for your participation. This questionnaire survey aims at investigating into the application of construction planning tools and techniques in the Ghanaian construction industry. Please fill in the questionnaire using the instructions, which will only take you about 10 to 15 minutes. Please be noted that all the information you provided is anonymous and will be only used for academic purpose. Thank you again for your valuable time. If you have any queries, please feel free to contact:

SAMUEL ROOT KWABLA DOE

Department of Building Technology

KNUST.

Tel: +233244120990

Email: rotsamdoe@yahoo.com

Section A: Background Information

Q1. Please indicate the name of your organization. (Optional)

……

Q2. Please indicate your role in your organization.

[ ] Quantity Surveyor

[ ] Contractor

[ ] Project Manager

[ ] Civil Engineer

[ ] Site Manager

Others (please specify) ……

Q3. Please indicate how long have you been working in your organization.

[ ] Less than 5 years

[ ] 6 to 10 years

[ ] 11 to 15 years

[ ] Above 16 years

Q4. Please indicate how long have you been working in construction industry.

[ ] Less than 5 years

[ ] 6 to 10 years

[ ] 11 to 15 years

[ ] Above 16 years

Section B: Considering main objectives

Q5. Which of these construction planning tools and techniques are you familiar with? Please you can tick more than one.

[ ] Gantt Charts

[ ] Work breakdown structure (WBS)

[ ] Cost breakdown structure (CBS)

[ ] Critical path analysis (CPA)

[ ] Resource histogram (RH)

[ ] Gates and milestones (G&M)

[ ] Training Programmes

[ ] Impact Assessment Technique

[ ] Stage Gate Process

[ ] Schedule crashing

[ ] Decision tree analysis

[ ] Option evaluation chart

[ ] PERT – Program Evaluation Review Technique

[ ] Network Analysis

Others (please specify) ……

Q6. Please indicate using the scale provided to what extent are the below construction planning tools and technique does your organization utilize. *5= very high; 4= high; 3 = intermediate; 2 = low; 1= negligible*.

NO.	FACILITIES	levels of influence				
		1	2	3	4	5
1	Gantt Charts					
2	Work breakdown structure (WBS)					
3	Cost breakdown structure (CBS)					
4	Critical path analysis (CPA)					
5	Resource histogram (RH)					
6	Gates and milestones (G&M)					
7	Training Programmes					
8	Impact Assessment Technique					
9	Stage Gate Process					
10	Schedule crashing					
11	Decision tree analysis					
12	Option evaluation chart					
13	PERT – Program Evaluation Review Technique					
14	Network Analysis					
	Others (please specify)					
15						
16						
17						

Q7. How often do you apply these construction planning tools and techniques in your organization?

[ ] Very Often

[ ] Often

[ ] Neutral

[ ] Not at all

Q8. **Challenges associated with the adoption of these planning tools and techniques by the Small scale contractors in the Ghanaian construction industry**

In your experience, indicate the level of influence of each challenging factor associated with the adoption of these planning tools and techniques by ticking the appropriate boxes.

5= extremely challenging; 4=very challenging; 3=moderately challenging; 2=slightly challenging; 1= not at all challenging

NO.	**CHALLENGING FACTORS**	**levels of influence**				
		1	2	3	4	5
1	Management problems					
2	Limited finance					
3	Limited project planning knowledge					
4	Environmental problems					
5	Corruption					
6	Labour mobility problems					
7	Awareness problems					

8	Policy problems					
	Others (please specify)					
9						
10						
11						

Q9. **Strategies to enhance the application of construction planning tools and techniques by Small Scale Construction firms.**

Please kindly rate the following strategies that can be employed to enhance the application of construction planning tools and techniques on the scale 1-5.

5= extremely significant; 4=very significant; 3=moderately significant; 2=slightly significant; 1= not at all significant

NO.	**STRATEGIES**	**levels of influence**				
		1	2	3	4	5
1	Restructuring of construction planning methodologies					
2	Government policy that mandate relevant agencies to champion SME re-orientation towards utilization of construction planning in their operations.					
3	Ensuring qualified construction planning personnel on construction projects					
4	Collaboration during construction					

5	Policy reforms with regards to financial support and training Programmes for firms and staffs					
	Others (please specify)					
6						
7						
8						

THANK YOU!