KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

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DEPARTMENT OF BUILDING TECHNOLOGY

ASSESSMENT OF PRODUCTIVITY MANAGEMENT PRACTICES ON GHANAIAN CONSTRUCTION SITES

A THESIS PRESENTED TO THE DEPARTMENT OF BUILDING TECHNOLOGY

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MASTER OF SCIENCE CONSTRUCTION MANAGEMENT

BY

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DECLARATION

I hereby declare that this work is the result of my own original research and this thesis has neither in whole nor in part been prescribed by another degree elsewhere. References to other people's work have been duly cited.

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May the Almighty God richly bless you all.

DEDICATION

This thesis is dedicated to my grandmother, Rose Osei, a.k.a Maame Afia Pokua.

ABSTRACT

There are undue cost overruns, delays and loss of productivity associated with the delivery of major capital construction projects in most developing countries. However, productivity measurement remains one of the basic techniques for efficient and effective performance. With the continuous increase of competition in the construction industry coupled with increasing cost of labour, construction contractors are continuously searching for ways of eliminating waste and increasing productivity. Hence, the aim of this study was to assess productivity measurement practices on construction site, which was guided by these research objectives namely: to assess the important attributes to productivity measurement, to identify factors affecting productivity and to establish ways of improving the technique in general. On this basis, critical review of literature was done, leading to questionnaire design. Questionnaires were administered to D1K1 contractors purposively. Data collected from the survey was analysed using descriptive statistic and Kendall's Wallis test. Findings of the research point out to the fact that, curbing construction delay, increasing in output rate, motivation of workers and improving company's performance were the most significant factors for which a company will implement productivity measurement techniques. In addition, plant and equipment, site organization, government policy, materials and labour force, proper planning were also classified as factors which affect the practices of productivity measurement among various construction firms under studied. Moreover the research revealed that for efficient and effective practices of productivity, the following should be put in place namely: improved health and safety, proper materials handling, workers motivation, proper site layout and setting targets for workforce. The research therefore,

recommended that workers should be trained in the area of productivity measurement, through seminar and workshop. Furthermore, a research can be done by including the other classes of contractors.

Keywords: Productivity, Measurement, Ghanaian, Construction

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CHAPTER ONE

GENERAL INTRODUCTION

1.1 BACKGROUND OF THE STUDY

The construction industry is an industry pertaining to infrastructural development such as buildings, roads, bridges, dams just to mention few. Construction activities may be of the same design but differs from one another due to environmental difference (Wegelius-Lehtonen, 2001). The construction industry employs many people; in 2005 the industry employed about 40 million people in China (Sridharan, 2007). In addition, the United States provided jobs for over 12 million people and substantially contributes to the Gross Domestic Product (GDP) of both developed and developing countries (National Council for Construction, Zambia, 2004: (Sectoral Activities Programme, 2005; Jergeas, 2009; Levy, 2007). It is the largest and most challenging industry in the world, its complexity and uniqueness is marked by the diverse skilled and unskilled as well as permanent and casual human resource of the industry, it employed about 8% of the US workforce representing about 11 million in 2007 (The Modular Building Institute, 2010) and 9% employment in Tanzania contributed about 5% to GDP (ILO, 2005). Human resource plays a strategic role in increasing the productivity of any construction organization (Attar *et al*., nd: Harris *et al*., 2008).

The basic aim of companies in the construction industry is to make profit by efficiently and effectively producing products at lower cost. It takes the effort of management to achieve the stated aim because they are the vision bearers of the companies making it

imperative for them to devise strategies which will fulfil project requirement thus; time, cost and quality (Harris *et al*., 2008: Pekuri *et al.,* 2011; Deng *et al.,* 2012).

The American Association of Cost Engineers defined productivity as a "relative measure of labour efficiency, either good or bad, when compared to an established base or norm." Productivity is the ratio of output to input per man's working hours which can be describe as efficiency of man's working hours (Mawdesley and Qambar, n.d). Intergraph defined Productivity as "the measure of the rate at which work is performed". The management practices of a company directly affect its productivity level (Dozzi and AbouRisk, 1993).

There are undue cost overruns, delays and loss of productivity associated with the delivery of major capital construction projects everywhere. With the continuous increased competition in construction projects coupled with increasing cost of labour, construction contractors are continuously searching for ways of eliminating waste and increasing productivity (Mastroianni and Abdelhamid, 2003; Dozzi and AbouRizk, 1993).

1.2 PROBLEM STATEMENT

The construction industry is faced with decline in construction productivity (Latham, 1994) and challenges concerning improvement in productivity (Pekuri *et al.,* 2011). Intergraph (2012) asserted that inefficiency in the construction industry is attributed to labour factors leading to many project overrun across the globe. Siebers *et al.,* (2008) pointed out that management practices are the cause of productivity between different entities, in addition Ogunlana (1996) put forward that low productivity in Thailand

construction industry is as a result of poor performance of site workers and deficiencies in construction organisations.

Sarhan and Fox (2013) indicated that construction practitioners in the UK have common techniques for measuring productivity. Ghana cannot be left out with regard to decline in productivity in its construction industry; scientifically work study has been proposed to efficiently and effectively measure the productivity of labour force around the globe.

It is not certain whether the Ghanaian construction industry has employed such tool to boost productivity. Against this background, this study sought to provide information on the productivity measurement techniques employed in the Ghanaian Construction Industry.

1.3 RESEARCH QUESTIONS

These are the questions which the study answered

1. What is the importance of productivity measurement function to Ghanaian Construction Industry?
2. What factors affect productivity measurement in the Ghanaian construction industry?
3. How can productivity measurement practice be improved in the Ghanaian construction industry?

1.4 AIM

The aim of this study was to examine the productivity management practices on Ghanaian construction sites.

1.5 OBJECTIVES

1. To assess the importance attributed to the productivity measurement function in the Ghanaian construction industry;
2. To identify the factors affecting productivity measurement in the Ghanaian construction industry; and
3. To identify the possible ways of improving productivity in the Ghanaian construction site.

1.6 SCOPE OF THE STUDY

This study investigated productivity measurement practices of construction firms in Ashanti Region.

1.7 JUSTIFICATION

The relevance of this study was to emphasize on the need for productivity in the Ghanaian based construction firms , even now and then most construction project are being handled by foreign based construction firms because of their ability to deliver on time. Estimators within a construction company must learn to forecast scientifically, a realistic quantity of productivity value in order to be competitive and to survive in today's bidding environment. To obtain these realistic values for both present and future competitions, the use of time study becomes desirable. Time Study is the analysis of a

specific job by a qualified worker in an effort to find the most efficient method in terms of time and effort. Time Study measures the time necessary for a job or task to be completed using the best method.

1.8 RESEARCH METHODOLOGY

This study adopted the case study approach of **D1 K1 contractors** to obtain the required data which allowed accurate data organisation, analyses and interpretation. This approach was adopted because most international researchers used it for their works of similar nature (Takim *et al.*, 2003). The case study approach explicitly produces better results in the assessment of productivity (Deng *et al.*, 2012).

1.9 ORGANISATION OF THE RESEARCH

Chapter 1: Introduction: This was a general introduction to the research topic. It captured the background information of the research, the problem statement, aims and objectives, the scope of the study and justification of the research.

Chapter 2: Literature Review: This chapter dealt with the relevant literature of this study. It discussed and reviewed existing literature of studies on the subject which subsequently forms the foundation for the analysis and interpretation of the research data.

Chapter 3: Methodology: This section dealt with the methods employed in the study. It provided information on the research tools and methods employed in collecting the data for the study.

Chapter 4: Discussion and Analysis: The answers provided by the respondents were critically analysed by both inferential and descriptive statistical methods in this chapter.

Chapter 5: Conclusion and Recommendation: This chapter gave the conclusion to the research and the possible recommendations for further research.

CHAPTER TWO

LITERATURE REVIEW

2.1 CONSTRUCTION INDUSTRY

Construction is as old as man, which can be traced to the stone ages thus the hunting stage. People at that stage of construction built by piling up stones, such incudes the Pyramid of Egypt and Castles constructed in the European world (Ritz, 1994).

The Construction Industry is complicated and complex within the industries in the world of today (Mawdesley & Qambar, 2000). The Construction Industry came into existence when massive infrastructure which includes power dams, transportation systems, bridges and skyscrapers just to mention few began during the industrialised stage of civilisation (Ritz, 1994; Levy, 2007), where plant and equipment such as excavating and earth moving plant, concrete technology tools, handling equipment, hoisting equipment and small powered plant (Badu & Owusu-Manu, 2011). During this stage of construction, man's contribution was lessen because of the rate, how effective and efficient plant and equipment was used (Ritz, 1994).

The development of a nation is subject to the provision of infrastructure (Mawdesley & Qambar, 2000). From literature, as the days go by, the rate at which work is done increases with respect to increase in technology, because technology has make work easier and faster in the 21st century. The Construction Industry cannot be left out in the world's economy because it forms an integral part of the economies of the world (Ritz, 1994). The Construction Industry is noted for three basic success indicators thus Time, Cost and Quality (TCQ).

The construction industry employs many people, in 2005 the industry employed about 40 million people in China (Sridharan, 2007), in addition the United States provided jobs for over 12 million people and substantially contributes to the Gross Domestic Product (GDP) of both developed and developing countries (National Council for Construction,Zambia, 2004: (Sectoral Activities Programme, 2005; Jergeas, 2009; Levy, 2007). It is the largest and most challenging industry in the world, its complexity and uniqueness is marked by the diverse skilled and unskilled as well as permanent and casual human resource of the industry, it employed about 8% of the US workforce representing about 11 million in 2007 (The Modular Building Institute, 2010) and 9% employment in Tanzania contribution about 5% to GDP (ILO, 2005).

In addition, Harris *et al.*, (2006) declared that the Construction Industry support about 8-10% to the economy through GDP and (Potts, 2008) also stress that the Construction Industy supports the GDP of developed economy by 8%. The Construction Industry in America support its economy by 9% (Levy, 2007). Badu and Owusu-Manu (2011) pointed out that the Construction Industry in the developed countries spports their economy by one-third of its physical infrastructure. Although, the Construction Industry substantially support the economy of both developing and developed countries, it has suffered a great decline productivity performance (Choy, 2004). The decline in construction productivity according to Jergeas (2009) which manifest in the form of construction delays, cost overruns and loss of productivity is attributed to poor management practices.

2.2 GHANAIAN CONSTRUCTION INDUSTRY

The Ghanaian Construction Industry contributes the same quota to its GDP (approximately 5-10%) as compared to other economies of the world, however the Annual Review Report by the Ghana Statistical Service (2007) indicated that within the past decade the Ghana Construction Industry contributed 8.2% GDP to the economy of Ghana. From the 2010 Population and Housing Census indicated that, the Ghana Construction Industry employs about 317,525 representing 3.1% of the Ghana workforce excluding those in the real estate, water supply, sewage and waste management (Ghana Statistical Service, 2012).

The industry contributes to every other sector because infrastructure development is the other of the day. Infrastructure development contributes into the economy because it solely depends on the labour market, procurement of materials, plants just to mention few. Due to its state in the world economy as a developing country, projects such as buildings for office complex, hospitals, classrooms, hostels, industries just to mention few, bridges, dams, roads just to mention few. The Kuffour Administration attempt to revamp the economy of the Ghana affirmed it support to infrastructure development (National Development Planning Commission, 2003).

The 2011 Budget Speech of the Republic of Ghana delivered by Dr Kwabena Duffour pointed that, the growth of the manufacturing sector of the Ghanaian has construction as one of the giant supporting industry (The Republic of Ghana, 2010). Construction/Consulting Companies in Ghana has been classified into DIKI, D2K2, D3K3 and D4K4 respectively in order of performance and financial standings by the Ministry of Water Resources, Works and Housing (Ministry of Water Resources, Works

and Housing, April-June 2006). The Ghana Construction Industry is not an exception to challenges faced by other Construction Industries in both developed and developing companies such includes cost overrun, time overrun and labour unrest just to mention few. The Ghanaian Construction Industry can be related to a pyramid because the classification serves as an impediment to small-scale construction firms (Amoah *et al.*, n.d). According to Owusu-Manu (2008), low productivity one of the acute challenges faced in the Construction Industry in Kumasi.

2.4 PRODUCTIVITY

Productivity is considered as one of the most important and influential variables governing economic production activities (Pekuri *et al.*, 2011; Tangen, 2005; Singh *et al.*, 2000). It is also one of the most frequently used performance indicators to assess the success of a construction project as it is the most crucial and flexible resource used in such (Construction Industry Institute, 2006). While high productivity can be a significant source of competitive advantage for companies (Grossman, 1993), it also contributes to the general well-being of a society. Even though high productivity can be a significant source of competitive advantage for companies (Grossman, 1993), it also contributes to the general well-being of a society. Considering the size of the construction industry, productivity trends in this industry have notable effects on national productivity and on the economy as a whole (Allmon *et al.*, 2000). The increased global competition has forced companies and authorities to put even greater emphasis on productivity improvements (Pekuri *et al.*, 2011).

Dozzi and AbouRisk (1993) defined productivity as "the physical progress achieved per persons-hour". Mawdesley & Qambar, (2000) also defined productivity as "the ratio of output to input per man's working hours", which can be describe as efficiency of man's working hours (Harris *et al.*, 2006). From the two definitions it can be deduced that, the resources invested in an activity should produce at least the same resources invested or better still better outcome. Productivity can also be defined as the numerical relation between a product (output) and its input resource. Productivity in construction can be said to be the way, the rate, the quality and the cost at which project is executed. According to Kim (1993), productivity improvement can be viewed as a continuous and orderly management process which implies change.

Productivity can be classified as high or low, high productivity means executing a task within the shortest available time by optimising cost not at the expense of quality and with minimise wastage of resources production and operations management and low productivity is executing the same quantity of task within a longer time frame with maximum waste of resources. The United States construction industry experienced decline growth in productivity (Ritz, 1994). Levy (2007) asserted that the construction industry in the United States had seen decline and still walloping in retarded growth.

2.5 FACTORS AFFECTING PRODUCTIVITY

The outcome of every project highly depends on the factors that come into play; construction productivity is affected by materials timeliness, human-related factors and management practices (Dozzi & AbouRisk, 1993). Moreover, Hewage and Ruwanpura (2006) classified factors affecting productivity into nine, these includes design and changes, worker motivation, inadequate communication, worker skills, non-availability

of information, lack of planning, congested work areas, inadequate supervision, and adverse weather conditions. Siebers *et al.,* (2008) asserted that factors affecting productivity is management practices.

Jergeas (2009) also lined out poor management practices which affects productivity in the negative sense such include scope changes, error in project designs, improper planning and scheduling of activities within a project, improper management of plant and equipment, improper management materials and improper allocation of workforce on projects. Fugar and Agyarkwah (2010) indicated that low productivity of the Ghanaian Construction Industry is categorised as materials, labour force, scheduling and controlling, environmental changes,contractual relationships, financial and government action. However, Amoah *et al.,* (2010) in their discussion accentuated that, low productivity in the GCI is classified into two broad topics thus governments fiscal policies and mangement related issues. Management related issues include health and safety, site organisation, communication, interpersonal skills, availability of training proprietors and technicians.

Earlier a research conducted by Ncwadi and Dangalazana (2006) indicated that the Construction Industry in South Africa is with the various challenges lack of experience in construction business, lack of equipment, racial discrimination and lack of managerial skills. In addition Wasi and Martin (n.d) itemised that, Cash flow, Contract documentation, Management skills, working relationships, Office facilities and equipment, Level of communication, Cultural impact and Financial management skills are challenges faced by indigenous contractors in Papua New Guinea.

The construction industry is labor-intensive. It can be argued that manpower is the dominant productive resource which makes the construction productivity mainly dependent on human effort and performance (Jarkas, 2010). Poor labour productivity is as a results of improper supervision, personal shortages, missing materials,poor operating systems, incomplete design documents, poor communications are all managerial related challenges (Ritz, 1994). They may be discrepancies in the factors affecting productivity because different researchers or criteria for categorisation of the factors are attributed to the topics treated by the various productivity researchers. From an analytical point of the factors can be classified under one big umbrella because whether it is worker motivation, communication, information, supervision comes back to management practices. Many construction projects results in cost overrun, delays because management at times compromise some of the projects performance such as time, cost and quality

2.6 PRODUCTIVITY MEASUREMENT TOOLS

Sarhan and Fox (2013) indicated that construction practitioners in the UK have developed common techniques for measuring productivity. Chang (1991) proposed the units completed approach, percentage complete estimation, effort or incremental milestones, and start and finish productivity measurement approach. According to Noor (1998), productivity measurement techniques fall within two broad categories of observational methods, which consist of continuous observation (e.g. direct observation and work study) and intermittent observation (e.g. audio-visual methods, delay surveys and activity sampling). Lee *et al.*, (2005) indicated earlier that most developed countries have introduced their own project techniques measurement tools. Noor (1998) further observed that the continuous observations such as direct observation and work study provide high

levels of accuracy and detailed data for understanding productivity. That notwithstanding, the method was considered time-consuming, tiring and expensive. Given the operational necessity of construction projects and the ever increasing time constraints exerted on project schedules, the cost of employing a personnel to conduct time study observations both in terms of the monetary cost and the time value of observation would discourage companies from adopting such measurement techniques.

Addititionally, the benefits of continuous observations are detracted by the unstoppable restrictions of scope which eventually makes it difficult for large companies to pursue this approach. Where the use of equipment for audio-visual methods are concerned, Winch and Carr (2001) were extremely careful that the workers might feel that the surveillance was unnecessarily intrusive. As such, they avoided the use of such methods to observe the workers and opted instead for direct observation where the researchers got to know the individual workers on a personal level (Chan and Kaka, nd). Thus, while the workers' uneasiness was achieved completely overcomed, the inability to observe the whole construction process became evident.

With respect to intermittent observations, Noor (1998) observed that these methods are prone to errors in determination. That is, the data tends to be aggregated statistically through the observation of a representative sample. Radosavljevic and Horner (2002) revisited formwork and masonry productivity data sets across eleven sites in the USA and the UK, only to confirm their suspicion that productivity is not normally distributed, thereby implying that some basic statistical diagnostics may give misleading results and are not applicable'. Serendipitously, Radosavljevic and Horner (2002) made a short

comparison of the data with volatility studies in econometrics to reveal surprising similarity with Pareto distributions, which are typical of chaotic systems.

Productivity can be measured by observing the process of which an activity is executed. Such observation is done in a well thought manner because it will demoralise workers upon realising that they are been observed (Dozzi & AbouRisk, 1993). Dozzi and AbouRisk (1993) suggested that productivity can be improved by measuring it. It can be measured by comparing the work done on the project site as against the estimated standards produced during the tendering stage of the project. The work been done on the project site can visualised as provided in **Figure 1.1**.

The construction industry has adapted productivity measurement tools as a way of critiquing project performance by systematically examining the invested resources, end products of resources as well as the project outcome. Such tool is adapted to ascertain the effectiveness and efficiency of a project, however, it is indicated that many frameworks introduced in construction to access project success is more theoretically than practically proven (Takim, Akintoye, & Kelly, 2003).

Before undertaking such activities, indicators of success should be determined (Nelson & Economy, 2005) because there are crucial circumstances which directly and indirectly impact on construction productivity (Mawdesley & Qambar, 2000).

2.6.1 Work Study

Work study is a systematic approach of observing, recording, analysing and examining how an activity is carried out by employees (Work Studies, 2009). Production and

Operation Management (n.d) added that Work Study is done to improve productivity efficiency by eliminating waste and unnecessary operations.

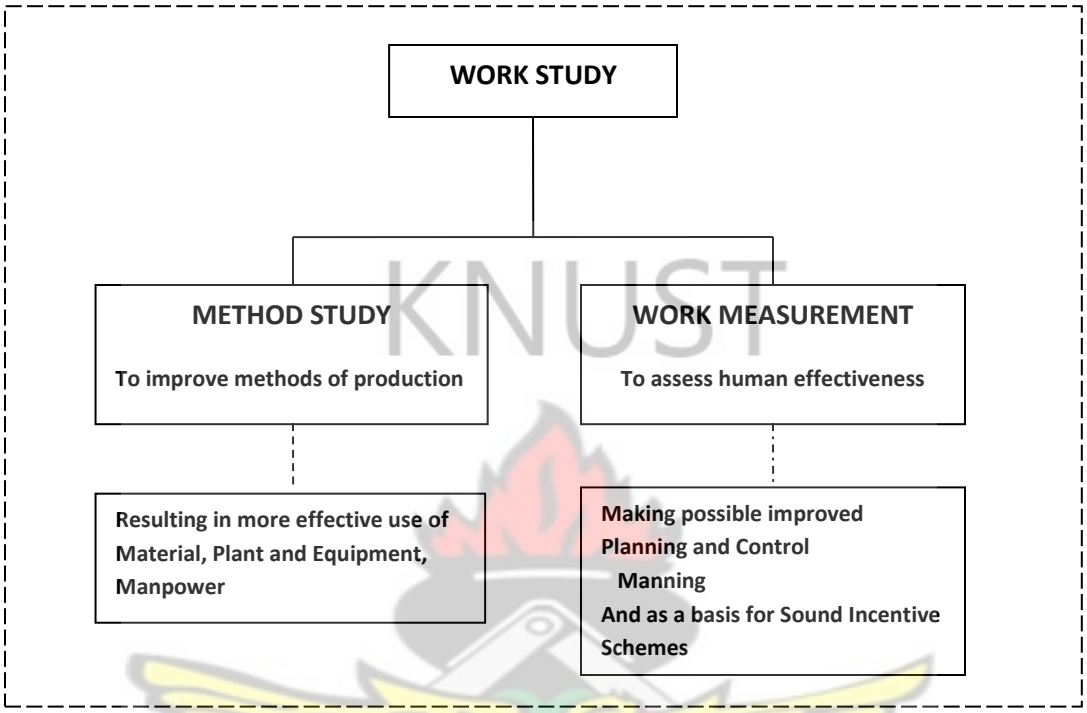


Figure 1.1: Work Study

2.6.2 Method Study (Ms)

BS 3138 defines Method Study as "the systematic recording and critical examination of ways of doing things in order to make improvements." From the BS definition, Method Study can be said to be an analytical approach of by which an activity is executed on the construction site. In Production and Operations Management (n.d) Method Study (MS) was defined as "the systematic recording and critical examination of existing and proposed ways of doing work, as a means of developing and applying easier and more effective methods and reducing costs.

Method study is mostly implemented on construction projects to curb the challenge of cost overruns, time overruns, excessive wastage of resources, quality related issues, workers incompetence, MS is a result oriented activity. The application of work study subjects each activity of operations into a systematic examination. The Production and Operation Management (n.d) stated that Selecting, Recording, Examining, Developing, evaluating, defining, Installing and Maintaining (SREDIM) are the procedures involved in MS.

2.7 HOW TO IMPROVE PRODUCTIVITY

Theories of improving productivity vary from business to business. Due to the variety of uncontrollable productivity influence factors, it is difficult to have a common theory of improving productivity from one business to another (Motwani *et al*., 1995). According to Burton (1991), companies should only track the important activities. Research also shows that concentrating on productivity improvement in the larger portions of non-productive employee time would be more effective (Motwani *et al*., 1995). According to Motwani *et al*. (1995) improving communication skills, preplanning and stricter management could help to raise the individual productivity rate from an average of 32 per cent productive time per hour to about 60 per cent per hour. It is however, interesting to note that in order to increase productivity by 10 per cent, all that must be done is to achieve an additional 15-16 minutes to the productive time each day for the average craftsman (LaPlante, 1991). Productivity improvement is necessary if it is to eliminate excess workforce and other resources (Harris *et al.*, 2006). Productivity could be inproved with the aim of dealing with inefficiency and waste (The World Bank, 1994).

The World Bank (1994) stated that, improvement of productivity in infrastructure development can be felt greatly if there if competition in the infrastructure industry.

2.7.1 Management Practices to Improve Productivity

Nelson & Economy (2005) in their book The Management Bible classified management functions as Planning, Organizing, Leading, Controlling, Energizing, Empowering, Supporting and Communicating. Allmon *et al.* (2000) posited that management practices are not a leading contributor to construction productivity changes over time.

Motivation

People are the great asset in the Construction Industry because without them, no effective work can be. Eventhough 21st century is known for technological advancement, such as the building of robots, plant and equipment to undertake some activities in the construction in order to increase productivity (Badu & Owusu-Manu, 2011), the effort of man is needed because they operates on these equipment. The Oxford concise dictionary (11th edition) defined motivation as " the reason or reasons for doing something". The workforce can be directly related to the productivity of a construction project because they are the implementers of the designed projects. Ritz (1994) named that, the first motivational tool adopted by management is to establish the goals of the project to the workforce. Job descriptions is very paramount towards the performance of workers. F.W. Taylor and H. L. Gantt within World War 1introduced a method for scheduling activities, which visually shows the work ahead, what have been achieved and the activities left to be executed.

Workers are motivated by different ideologies (Nelson and Economy, 2005). Abraham Maslow needs theory indicates that man is trou

Communications

The Concise Oxford English Dictionary (Eleventh Edition) defined communication as "the means of sending or receiving information". Nelson and Economy (2005) expalined communication as the lifeblood of every organisation. It can be related to the veins and arteries of the human system because it provides life to the human body by sending signals and blood from the heart and mind to other parts of the human body.

Ritz (1994) also clarified that, unless effective communication system is implemented in organisation it would be impossible for a successful project execution. Communication would be effective in an organisation when there is an established goal, rapport between management and the workforce, analytical reasoning by all members of the firm. Systems like audi-visual can be adopted in order to relay informations effectively to the workforce. Ahadzie and Amoa-Mensah (2010) showed that, to improve productivity in the Ghanaian Construction is to actively work on the communication skills on construction sites.

Just-In-Time (JIT)

Just in time (JIT) is a management practice which usually forms the backbone of coherent organisational systems. This management tool was initially inspired by Japanese production systems and aimed at maximising the speed of product delivery and service quality. Although the foundations have been developed by Henry Ford in the early 1920s,

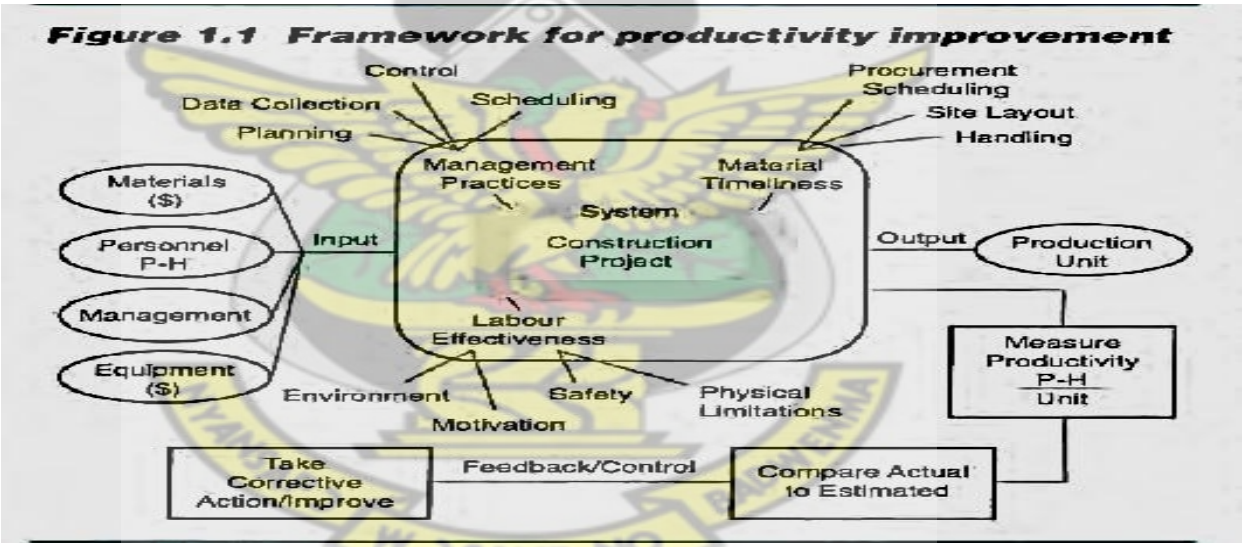
the JIT philosophy became well-known in the 1950s as part of the Toyota Production System. JIT is an inventory strategy implemented to improve the productivity of a business by reducing in-process inventory and its associated costs (Siebers *et al*., 2008). At a firm-level, JIT has been found to have mixed effects, ranging from positive to negative effects (Callan *et al*., 2000; Kaynak, 2003; Kaynak and Pagan, 2003; Sale and Imman, 2003; or Callan *et al*., 2005). A study conducted by Lawrence and Hottenstein (1995) on the impact of JIT on productivity at plant-level reports of a positive results.

At firm-level, Brox and Fader (1997; 2002) found that JIT increases productivity and cost efficiency. Brox and Fader (1997; 2002) further defined JIT as a mixture of JIT/TQM practices which includes integrated product design, integrated supplier network, plan to reduce set-up time, quality circles, focused factory, preventive maintenance programs, line balancing, education about JIT, level schedules, stable cycle rates, market-paced final assembly, group technology, program to improve quality (product), program to improve quality (process), fast inventory transportation system, flexibility of worker's skills. This combination of all these set of practices imply that the impact of separate practices cannot be differentiated (Siebers *et al*., 2008).

Lawrence and Hottenstein (1995) found a positive association between JIT and performance in their analysis of Mexican plants affiliated to USA companies. The study used substitutes for performance (quality, lead-time, productivity and customer's services) and for JIT management practices (extent of employees' participation, suppliers' participation and management commitment). Callen *et al.,* (2000) also revealed that JIT is associated with improved quality of process and product, lower costs and

higher profits. Kaynak and Pagan (2003) concentrated on estimating the JIT related sources of technical inefficiency. The results suggested that internal organisational factors (such as the top management being committed to implementing JIT) are related to higher productivity, whereas external organisational factors (such as supplier value added, or transportation issues) are not.

Subsequently, Callen *et al.,* (2005)'s study scrutinized the collaboration among performance outcomes, investment in JIT management practices, and productivity measurement at the plant-level, suggesting that productivity measurement mediates the relationship between performance outcomes and the extent of JIT management practice adoption.



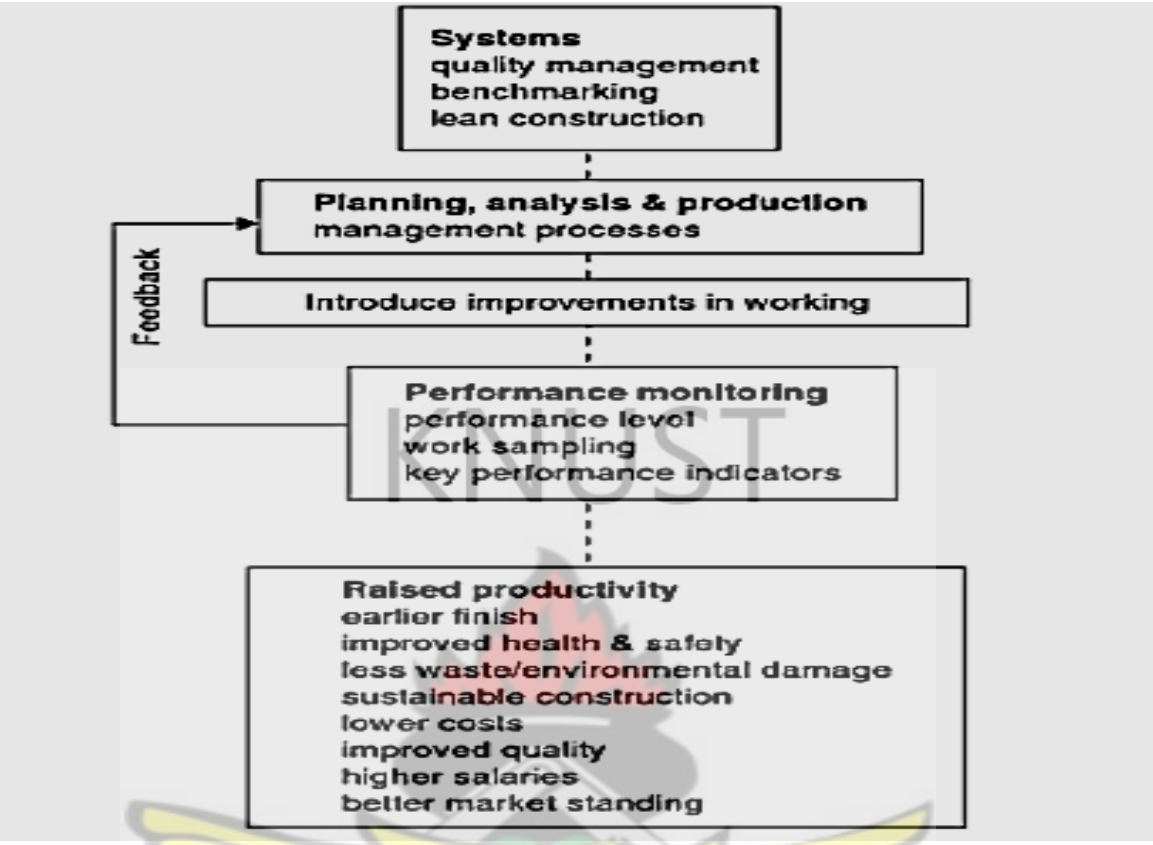


Figure 2.2 Model for continuous improvement in productivity Source (Harris *et al.* , 2006)

Summary

This chapter has critically reviewed various literature relevant to the study undertaken. Hence, bring it more contemporary discussion as per the research objectives guided by the research questions raised.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

In order to help in achieving the research aims and objectives, this chapter examined research methods with the outlook of finding the best methodology to answer the research questions raised. The drive of any research methodology and research design as recognized globally is to provide direction in the planning and implementation of the study in a manner most likely to attain the intended goal. Collis & Hussey (2003) argued that research methodology is the overall approach to the design process from the hypothetical foundations to the collection of data and analysis adapted for a study. Methodology is then a way by which we gain knowledge about the world, trying to discover how we can go about the task of finding out what we believe to be true (Christou *et al*., 2008). Hence, this chapter first deliberated the philosophy that underpins the approach taken for the study, discussing the researcher's positivist stance to research and the consequent choice of a quantitative approach. The next section discussed the approach to data collection and then the data collection instrument. The chapter then provided an overview of the research population and sampling technique and the unit of analysis.

3.2 PHILOSOPHICAL POINT OF THE RESEARCH

From literature point of view, the philosophical queries of existence, knowledge, and value, have significant influences in the research design (Koetting, 1996; Christou, *et al*.,

2008). Thus, such philosophical matters of ontology, epistemology, axiology and methodology assumptions needs to be addressed explicitly since they shape the choice of research instruments (Christou, *et al*., 2008). Epistemology is the branch of philosophy concerned with how individuals determine what is right; positivism and interpretivism (Streubert & Carpenter, 1999). This research follows the positivists approach to knowledge. For the positivists, through the accumulation of verified facts, scientific knowledge is established (Bryman, 1992; *c.f* Osei-Hwedie, 2010). The research was of the opinion that assessing the importance attributed to the productivity measurement functions in the Ghanaian construction industry (free of researcher effects) can be replicated.

At the ontological level, the position adopted for this research is objectivism. Ontology refers to enquiring the existence of a 'real' world that is sovereign of our knowledge; it is a theory of living being (Marsh & Stoker, 2002). This is because identification of the productivity measurement tool being adopted in the Ghanaian construction industry exist as external facts that are beyond the reach and influence of the researcher. Thus, in answering the research question; which variables are for assessing productivity measurement in the GCI? The objectivism ontological position was followed.

3.3 RESEARCH STRATEGY

This section explains the direction the researcher takes conducting the research. Naoum (1998) defines research strategy as the enquiry of research objectives. Accordingly, Baiden (2006) asserted that, the three main types of research strategies are quantitative, qualitative, and triangulation. However, the choice to adapt any particular strategy

depends on the purpose of the study, the type, as well as availability of information for the research (Naoum, 1998; *c.f* Baiden, 2006). Hence, this research adapts a quantitative strategy, as the main data collection techniques used in this research was questionnaires. This method will allow the researcher to ask all respondent the same question with predetermined responses, which allowed objective data to be collected throughout the study therefore being in cycle with the positivist tradition with survey as the main data collection approach.

3.4 RESEARCH DESIGN

A research design is a collection of guides or rules or data collection (Adams & Schvaneveldt, 1985; Ogoe, 1993). This pacts with the structure for data collection and analysis; the structure that influences the technique for collection and analysis of data and provides the connection between empirical data as well as its conclusions in a logical sequence to the initial research question of the study (Yin, 2003; Bryman, 2004; Baiden 2006). The research adopted a questionnaire survey in the quest to assess productivity management practices on Ghanaian construction sites. The need for generalization in the findings across various construction sites in Ashanti region influenced the choice of questionnaire survey. Questionnaire survey enhances consistency of observations and improves replication due to its inherent standardized measurement and sampling techniques (Oppenheim, 2003).

3.5 APPROACHES TO DATA COLLECTION

Data gathering is crucial in research, as the data contributes to a better understanding of a theoretical background (Bernard, 2002). It is therefore imperative that in selecting the

way in which the data will be obtained and from whom the data will be acquired be done with sound judgment, especially since no amount of analysis can make up for improperly collected data (Bernard *et al*., 1986; Tongoco, 2007). According to Naoum (1998) there are two approaches to data collection namely, fieldwork (primary data collection) and desk study (secondary data collection). Patton (2002) noted that using more than one data collection instrument strengthens and gives credibility to the study. The researcher will adopt the used of multiple sources of data because of the added benefits (such as the validity of the data gathered) associated with multiple sources (Owusu, *et al*., 2007). Hence, this approach for collecting data in this study will be divided into two main parts desk survey and field survey.

3.5.1 Desk Survey

The desk survey (literature review) forms an essential aspect of the research since it sets the pace for the development of field survey instruments using questionnaires, and interview (Fadhley, 1991 and Owusu, 2008). Secondary sources of information were identified and collected in books, articles, technical journals and from databases. The secondary source of information for this research was collected from two sources; mainly internal and external sources.

3.5.1.1 Internal Secondary Sources

These are published within companies or organizations, such as annual reports, information booklets, brochures, magazines, financial information memoranda and financial reports,

3.5.1.2 External Secondary Sources

The most accurate sources of information is the external secondary source. According to Wahab (1996) external secondary sources of data gathering is described as primary literature sources. Alternative sources of external secondary sources of information include textbooks, technical journals, newspapers, magazines and internet sources.

3.5.2 Field Survey: Primary Data Source

The field survey is involved with the collection of empirical data. Fieldwork can be associated with three practical approaches; the survey approach, the case study approach and the problem-solving approach (action research) (Naoum, 2007). A survey is used to collect original data for describing a population too large to observe directly (Mouton, 2001).The researcher used surveys because according to Robson (2002), surveys are used for relatively large number of respondents within a limited time frame. Robson (2002) added that there are two types of surveys available: the descriptive survey and the analytical survey (Robson, 2002).Hence, descriptive survey techniques was adopted.

3.5.3 Descriptive survey

Burns and Grove (2001) in explaining descriptive survey intimated that it is a study that observes and describes the presence, frequency or absence of characteristics of a phenomenon as it naturally occurs, in order to gain additional information. The primary purpose of a descriptive survey research is to describe the situation, preferences, practices, opinions, concerns or interests of the phenomenon of interests of the phenomenon of interests. Naoum (2007) added that the descriptive survey aims to answer such questions as: How many? Who? What is happening? Where? and When? It deals with counting the number of respondents with certain opinions/attitudes towards a

specific object. The counting can be later analysed to compare or illustrate reality and trends. Descriptive studies provide valuable base line information. The method is also flexible and can be used to collect information from a large group of respondents (Mouton, 2001).

The descriptive survey was selected because it provides an accurate portrayal or account of the characteristics, for example behaviour, opinions, abilities, and knowledge of a particular individual, situation, or group (Naoum, 2007). This design was chosen to meet the objectives of the study, namely: to assess the importance attributed to the productivity measurement function in the Ghanaian construction industry; to identify the productivity measurement tool being adopted in the Ghanaian construction industry; and to identify the variables which are assessed by the Ghanaian contractors.

3.6 DATA COLLECTION INSTRUMENT

3.6.1 Questionnaire Development

It was essential to establish the information to gather for relevant questions to be solicited (Oppenheim, 1996). Contemplations of appeal to respondents ease of reading and supplying the required data guided the format of the questionnaires. This enhanced proper usage of time during the data collection. The questionnaire designed included close-ended questions, open-ended questions and scaled response questions. The likert response scale employed, measures the strength or intensity of respondent's opinion. Some of the advantages of the self-administered questionnaires used include, it been an efficient way to collect statistically quantifiable information and an efficient method as many respondents can be reached within a short space of time (Twumasi, 1993). The

questionnaires structured to align with the main objectives of this study. Notwithstanding, the questions have also been structured in such a manner that the answers received would help achieve the research aim. Therefore, the questions focused on fulfilling the requirements of this study. Measures also deployed to keep the questions in the questionnaire in simple language, null and void of technical terms in order to minimize potential errors from respondents.

3.6.2 Questionnaire Design and Distribution

As described earlier, the format of the questionnaires aligned to meet the objectives of this research has four main parts. These parts focused on the background of the respondents, reasons for productivity measurement, factors affecting productivity and ways of improving productivity respectively. The questionnaires were distributed and retrieved in person. This ensured that the intended recipients, in order to help improve the response rate, completed the questionnaires.

3.7 SCOPE OF THE STUDY

Geographically, the study was carried out exclusively in Kumasi in the Ashanti Region, Ghana. However, contextually, it was on the assessment of productivity measurement practices on construction sites of D1KI Contractors.

3. 8. RESEARCH POPULATION AND SAMPLING TECHNIQUE

3.8.1 Research population

A research population can be defined as the totality of a well-defined collection of individuals or objects that have a common, binding characteristics or traits (Polit and Hungler, 1993). Burns and Grove (1993), added that a population is defined as all elements (individuals, objects and events) that meet the sample criteria for inclusion in a study. The research covered a population of five (5) D1K1 construction firms within the Ashanti Region. The main reason for using this category of construction firms is that they undertake complex and large construction works, in which productivity measurement is an integral part for them to achieve the main objective of the project in term of cost, time and quality.

3.8.2 Sampling Technique and Sample Size Determination

The term "sample" means a part of a whole (population) drawn to reflect the remaining (Naoum, 1998). Thus, sampling refers to the process of selecting a quota of the population to characterise the entire population. A sample, then, consists of a subject of the units that constitute the population (Polit & Hungler, 1999) and normally used in large-scale survey research for the sake of economy and accuracy (Weisberg & Bowen, 1977). However, research studies use simply a small fraction of the population, referred to as a sample. This is because using a sample is more practical and less costly than collecting data from the entire population. Polit & Hungler (1999) asserted that, the major risk of using a selected sample is that it might not adequately reflect the behaviours, traits, or beliefs of the population. The sampling technique for this endeavour based on its purpose, design, and practical implication of the research topic is purposive sampling.

Simply put, the researcher decides what needs to be known and sets out to find people who can and are willing to provide the information by virtue of knowledge or experience (Bernard, 2002; Lewis & Sheppard, 2006; Tongoco, 2007). In the context of this research, assessment of productivity measurement on construction sites of D1KI contractors was perceived. The targeted groups were D1KI contractors, hence a total of five (5) were considered. More so, in each firm questionnaires were administered five (5) selected people involving in daily activities on site, namely: clerk of works, site engineer, trade foreman, construction manager and operations manager respectively.

3.9 DATA ANALYTICAL TOOL

The choice of an analytical tool is dependent on a comprehensive review of available analytical and statistical tool. The decision for statistical consideration was to choose between parametric or non-parametric statistical test. The choice between the two tests depends largely upon the level of measurements achieved in the study and the type of variables. The principal statistical tool utilized was the non-parametric statistical testing using descriptive statistics and Kendall's Wallis.

3.10 SUMMARY

This chapter addressed the methodology for the research and the reason for the adoption of the methodology used for this research. The research approach used and the method of data collection was discussed i.e. the use of survey questionnaires. The chapter concluded with the research process and covered issues such as; the study area, sources of data, questionnaire developments, questionnaire response formats, content and design of the

questionnaires, distribution of questionnaire, targeted respondents, the scope of questionnaire survey, sample size determination, and data analytical tools.

CHAPTER FOUR

DISCUSSION AND ANALYSES

4.1 INTRODUCTION

This chapter is made up of two sections. These sections have been descriptively designed to meet the objective requirements of the study. The section one describes the background of the respondent and the companies surveyed. Productivity measurement, methods of productivity measurement tools, reasons for productivity measurement, factors affecting productivity, and strategies adopted to remedy these factors are descriptively analyzed in the second section of the chapter.

4.2 SOCIO DEMOGRAPHIC CHARACTERISTICS

The socio-demographic characteristics of the sampled companies and the respondents for the respective companies have been descriptively discussed in sections 4.1.1 and section 4.1.2.

4.2.1 Background of Respondents

This section of the study describes the background or the demographic characteristics of the respective respondents of the surveyed construction companies. Some of major characteristics considered included position in the company, working experience with the company, and the highest level of education of the respondents. The result of the section is presented in Table 4.1.

Table 4.1: Background Information of Respondents

Characteristics Of Respondents	Frequency	Percent
Position In Company		
Clerk of works	2	8.0
Site engineer	18	72.0
Trade foreman	1	4.0
Operations manager	4	16.0
Years Spent In The Company		
1-5 years	13	52.0
6-10 years	5	20.0
11-15 years	4	16.0
16-20 years	3	12.0
Highest Level Of Education		
JHS		
SHS/Technical		
Polytechnic	21	84.0
University	4	16.0

Source: Field Survey, 2014

From Table 4.1, out of the total respondent surveyed (n=25), the majority (72.0%) were site engineers in the surveyed companies. The majority (52.0%) of the surveyed respondents have worked with the surveyed construction companies for 1 to 5 years. The

highest level of education of the majority (84.0%) of the surveyed respondents was polytechnic education.

4.2.2 Background of Company

This section of study extends the socio demographic characteristics of the study by discussing the background information of the surveyed companies. The major characteristics of the surveyed companies considered were years of existence; the classes of the companies based on the Ministry Of Water, Work and Housing classification; number of staff; number of skilled staff; and number of permanent staff. The result is discussed in Table 4.2.

Table 4.2: Background Information of Company

Company Characteristics	Frequency	Percent
Company's years of existence		
1-5 years	4	16.0
6-10 years	7	28.0
11-15 years	14	56.0
Class of company based on MWWH		
D1K1	25	100
Number of staff		
1-10		
11-30	11	44.0
31-40	6	24.0
41-50	5	20.0
51+	3	12.0
Number of skilled staff		
5-15	12	48.0
16-25	7	28.0
26-35	2	8.0
36+	4	16.0
Number of permanent staff		
0-5	5	20.0
6-15	10	40.0
16-25	4	16.0
26+	6	24.0

Source: Field Survey, 2014

From Table 4.2, out of the total surveyed construction companies (n=25), the majority (56.0%) have been in existence for 11 to 15 years. Based on the Ministry of Water, Works and Housing company classification; only D1K1 construction firms were considered for this research, hence, questionnaires administered had a 100% percent responding rate. The majority (44.0%) of the surveyed companies have a staff body of one (1) to thirty (30) employees. The number of the skilled staffs of the majority (48.0%) of the surveyed construction companies is between five (5) and fifteen (15) employees. Furthermore, the number of permanent staffs of the majority (40.0%) of the surveyed construction companies was between six (6) and fifteen (15) employees.

4.3 PRODUCTIVITY MEASUREMENT IN THE GHANAIAN CONSTRUCTION INDUSTRY

This section of the study assessed the presence of productivity policies in the construction companies surveyed, periods of the policy implementation, productivity measurement, means of productivity measurement, and the adopted measurement tools. The results are presented in the **Table 4.3**.

Table 4.3: Productivity Measurement in the Construction Industry

	Variables	Frequency	Percent
Presence of productivity policy			
	Yes	21	84.0
	No	4	16.0
Person responsible for the policy			
	Site engineer	13	59.1
	Trade foreman		
	Tradesmen		
	Operations manager	9	40.9
Period of policy implementation in the project phase			
	Feasibility stage	8	38.1
	During actual construction	13	61.9
	Post construction stage		
Presence of standard labour output for the company			
	Yes	22	91.7
	No	2	8.3
Has firm undergone productivity measurement			
	Yes	20	83.3
	No	4	16.7
Means of productivity measurement			
	Against estimates	6	28.6
	Against labour output	13	61.9
	Against other projects	2	9.5
Measurement tool adopted by firm			
	Method study	2	9.1
	Work measurement	6	27.3
	Both	13	59.1

Source: Field Survey, 2014

From Table 4.3, out of the total respondents surveyed (n=25), the majority (84.0%) believed that their respective construction companies have productivity policies. From the survey, the majority (59.1%) of the respondents believed that the persons responsible for the policies are site engineers. The productivity policies were often implemented during the actual construction project phase as indicated by the majority (61.9%) of the surveyed respondents. The surveyed construction companies have a standard labour output as indicated by the majority (91.7%) of the surveyed respondents. Furthermore, the majority (83.3%) of the surveyed construction firms have undergone productivity measurement. The productivity in the construction companies surveyed was done against labour output. This is finding is surprising since existing literature shows that concentrating on productivity improvement in the larger portions of non-productive employee time would be more effective (Motwani *et al.*, 1995). The productivity measurement tools employed by the surveyed construction companies were method study and work measurement.

4.3 REASONS FOR PRODUCTIVITY MEASUREMENT

This section of the study assessed the reasons for the productivity measurement within the surveyed construction companies. Each reason for productivity measurement was measured on a five point 'Likert Scale' with score from (1 for ―strongly disagree‖ to +5 for ―strongly agreed). The result is discussed in Table 4.4.

Table 4.4: Reasons for Productivity Measurement

Reasons	1	2	3	4	5
Eliminate waste	4(17.4)	3(13.0)	3(13.0)	8(34.8)	5(21.7)
Curb construction delays	2(8.7)	2(8.7)	2(8.7)	11(47.8)	6(26.1)
Increase output	1(4.0)		5(21.7)	9(39.1)	8(34.8)
Motivate workers	3(13.0)	1(4.3)	10(43.5)	8(34.8)	1(4.3)
Improve company's performance	1(4.3)		1(4.3)	10(43.5)	11(47.8)

Rating [Strongly Disagree [1], Disagree [2], Quite Agree [3], Agree [4], Strongly Agree [5]]

Percentages are in parentheses

Source: Field Survey, 2014

From Table 4.4, out of the total respondents surveyed (n=25), the majority (56.5%) either agreed or strongly agreed that one of the reason behind productivity measurement is to eliminate waste. This finding is therefore consistent with literature that indicates that productivity improvement is necessary if construction companies are to eliminate excess workforce and other resources (Harris *et al*., 2006). Productivity could be improved with the aim of dealing with inefficiency and waste (The World Bank, 1994). The majority (73.9%) of the surveyed respondents also agreed or strongly agreed that one of the reasons behind productivity measurement in the construction companies was to curb construction delays.

Furthermore, the majority (73.9%) of the surveyed respondents either agreed or strongly agreed to the desire to increase output as one of the reasons behind productivity

measurement in the surveyed construction companies. The majority (43.5%) of the surveyed respondents of the construction companies also quite agreed to the motivation of workers as a major reason behind productivity measurement. The majority of the surveyed respondents also either agreed or strongly agreed to the desire to improve company's performance as a major reason behind productivity measurement in the surveyed construction companies in the studied area.

4.4 FACTORS AFFECTING PRODUCTIVITY UNDER THE MEASUREMENT PERFORMANCE

Respondents were presented with a list of 8 constraints or factors affecting productivity in the construction industry usually reported in the literature as hindering productivity in the construction sector. The task of each respondent was to rank the factors affecting productivity from highest [5] to least [1] considered as a constraint to productivity. The Table 4.5 displays the mean ranks and by extension, the ranks of the problems as adjudged by the 22 surveyed respondents in the construction sector.

Table 4.5: Factors Affecting Productivity in Performance Measurement

Factors	Mean Rank	Rank
Plant and Equipment	5.57	1
Site organisation	4.55	2
Government policy	4.55	2
Worker motivation	4.50	4
Materials	4.45	5
Labour force	4.27	6
Inadequate supervision	4.20	7
Inadequate communication	3.91	8
Test Statistics		
N		22
Kendall's W[a]		0.052
Chi-Square		8.053
Df		7
P-value		0.328

Source: Field Survey, 2014

This was obtained following the non-parametric test for k-related samples in SPSS 16. The level of agreement between the twenty-two (22) respondents in the surveyed construction companies was tested using the Kendall's coefficient of concordance since there are three or more judges or respondents.

Plant and equipment was ranked first whereas inadequacy of communication was adjudged the last or more specifically, the eighth on the list. The ranking of plant and equipment lapses as contributory factors to productivity challenges in the construction industry is consistent with the study of Jergeas (2009) that lined out the poor management practices which affect productivity to include plant and equipment. Site organisation, Government policy, Worker motivation, Materials, and Labour force fell in second (2^{nd}), third (3^{rd}), fourth (4^{th}), fifth (5^{th}) and sixth (6^{th}) positions respectively with mean ranks of 4.55, 4.55, 4.50, 4.55 and 4.27 respectively. This study was also not far from the study by Fugar and Agyarkwah (2010) that revealed that low productivity of the Ghanaian Construction Industry is categorised as materials, labour force, scheduling and controlling, environmental changes, contractual relationships, financial and government action.

Kendall's coefficient of concordance (W^a), testing the null hypothesis that there is no agreement (respondents differ significantly) among the surveyed respondents with respect to how constraining or the underlisted factors affect productivity in the construction companies was 'not rejected'. The degree of agreement as measured by the W-statistics is about 5% since the score is zero for random ranking and 1 for perfectly unanimous ranking. The surveyed respondents in the construction companies in the study area can therefore, be said to unanimously disagree to the ranking order due to the varying nature of the constraining factors in the surveyed construction companies.

4.2.3 Strategies Adopted to Tackle the Challenges of Productivity

In this section of the study, respondents were presented with a list of 9 strategies adopted to tackle the challenges or factors affecting productivity in the construction industry. The task of each respondent was to rank the strategies in regard of their agreement to their company's adoption of them in tackling productivity challenges. The ranking employed was from strongly agreed [5] to strongly disagreed [1] to the strategies as means of solving productivity challenges. The Table 4.6 displays the mean ranks and by extension, the ranks of the strategies as adjudged by the 22 surveyed respondents in the construction sector.

Table 4.6: Strategies for Improving Productivity

Strategies	Mean Rank	Rank
Proper planning of project	5.90	1
Improved health and safety	5.71	2
Proper materials handling	5.62	3
Motivation	5.45	4
Proper site layout	5.05	5
Setting targets for workforce	4.71	6
Good communication channels	4.50	7
Introduced Just-In-Time (JIT)	4.45	8
Introduced modular construction	3.60	9
Test Statistics		
N		22
Kendall's W[a]		0.111
Chi-Square		18.569
Df		8
P-value		0.017

Source: Field Survey, 2014

The non-parametric test conducted gave mean rank estimates that ranked the proper planning of project (5.90) as the most adopted strategy in tacking productivity lapses in the construction sector. This finding is partially consistent with a study by Motwani *et al*., (1995) that showed that improving communication skills, proper planning and stricter management could help to raise the individual productivity rate from an average of 32 per

cent productive time per hour to about 60 per cent per hour. This is followed by improved health and safety (5.71), proper materials handling (5.62), motivation (5.45), proper site layout (5.05), setting targets for workforce (4.71) and good communication channels (4.50) in that ranking order. The suggestions of Nelson and Economy (2005) in their book that strategies such as proper planning, organizing, controlling, energizing, empowering, and supporting should be adopted in attempt to improving productivity in organisations is partially consistent with the findings of the current study. However, the least ranked strategies adopted in tackling the productivity lapses in the construction companies surveyed were good communication channels, introduction of Just-In-Time policy and modular construction.

The Kendall's coefficient of concordance (W^a), testing the null hypothesis that there is no agreement (independence) among the respondents with respect to the adoption of listed strategies in Table 4.6 in tackling productivity problems in the construction sector was rejected at a 5% significance level. The degree of agreement as measured by the W-statistics is about 11%. This therefore implies that there is not much variation in the strategies adopted by the surveyed construction companies in their tackling of their productivity challenges.

CHAPTER FIVE

SUMMARY OF FINDINGS, RECOMMENDATIONS AND CONCLUSIONS

5.1 INTRODUCTION

The aim of the study was to assess the productivity management practices on Ghanaian construction sites. In this chapter, the research questions and the objectives are revisited to bring into light the extent to which the aim of the study has been achieved throughout the various phases of the study. The chapter also presents recommendations of the researcher based on the findings of the study and states the difficulties that were encountered throughout of the study. Lastly, recommendations are made for further studies.

5.2 SUMMARY OF FINDINGS

5.2.1 Reasons for Productivity Measurement

The study showed that one of the main reasons why construction firms are interested in productivity measurement is to curb construction delay thereby fulfilling one of the ultimate needs of project participants, which is time.

Moreover, majority of the respondents were also of the view that increase in output rate in the construction is an essential reason for which a construction firm will institute productivity practice as core element in achieving the best output.

More importantly, motivation of workers were believed to have had an integral part for which a company will go into productivity practices. It therefore must be seen in this light that, motivation of workers should be considered as an important factor for successful construction process.

The analysis however, revealed that respondents either agreed or strongly agreed to the desire to improve company's performance as a major reason behind productivity measurement. Hence, it must be recognized performance improvement must be related to effective communication among project stakeholders, quality assurance and recognition to timelines.

5.2.2 Factors Affecting Productivity

In drawing from the analysis, it came to the limelight that plant and equipment was an essential factor whose due presence on site when undermined could tremendously affect productivity.

Site organization was also another factor which respondents considered as the second most challenging factor that could have significant implication on construction productivity.

However, Government remain a major a pace setter in most forms of development especially the construction industry which remain a major contributor to the nation economy. Notwithstanding, the research revealed that Government policy remains an impediment to the practice of productivity in the GCI, for instance labour wages policy.

Materials and labour force account for the major part of the construction activities in terms of the time and amount spend. However, its neglects, as it has been perceived by respondents, could affect productivity on construction site.

5.2.3 Ways of Improving Productivity

Improving productivity will sure inure to the benefits of every project participant. On this basis, to effectively conclude on the discussion of assessing productivity practices on construction site, the following were identified as most significant ways of improving productivity.

Proper planning has always been considered as a major strategy in achieving successful construction process, which productivity practices is not exception to this. Hence, the study revealed that the proper planning is an essential tool for effective forbearance of productivity on construction site.

Improved health and safety was considered second with regards to ways of improving productivity on construction site and this, from the revelation of the study, is a matter of fact that needs to be given a deserving consideration in any effort to increase productivity on construction sites.

Proper materials handling as revealed from the study is very essential way by which productivity could be improved. The avoidance of wastage of materials that leads to loss of money could be a way of improving productivity on construction sites.

Motivation from the study is an important key to improving productivity on construction site. When motivation is duly practiced on construction site, the result is usually not far from an increased productivity. Hence, motivation becomes one of the ways of improving productivity.

Proper site layout is an essential practice on every construction site. Part of its relevance ensures safety and minimizes accidents on construction sites.

Setting targets for workforce compared to just allocating a workforce to task is surely a way of improving productivity on site. Maximum concentration becomes evident which leads to an increased level of input, thereby resulting to on time delivery and less errors.

Good communication channels could not be left out as part of the ways of improving productivity on site. This is a way of reducing confusion and mistakes because clarity and adequate understanding is achieved when there is the presence of good communication channels on construction site.

5.3 CONCLUSION

The interest in the adoption of productivity practices on our construction sites is growing. With an increasingly and rapidly changing nature of construction, the onus lies on the construction company and its team to improve their attitude towards the adoption of productivity management practices, thereby ensuring consistent and increased productivity on site. These recommendations proffered in this research would assist the construction industry in their productivity practice adoption.

5.4 LIMITATIONS OF THE RESEARCH

There were problems encountered in the course of conducting the study at the fieldwork phase, which posed serious constraints to the execution of the study. Meeting with staff involved following some protocol, which was in the first place time unbearable. More so, the study only considered only D1K1 contractors in Kumasi making the sample size relatively small.

5.5 RECOMMENDATIONS

The findings of this research are expected to contribute to more effective practices of productivity on GCI. To achieve this objective, this study proposes a set of recommendations to the construction industry with regards to their practices:

- Productivity techniques should be encouraged among contractors especially those involving in high risk project;
- A viable approach to the implementation of the productivity measure should be an integral part of the project formulation from inception to completion;
- Furthermore, training and seminars should be organised for various tradesmen and professionals on site, thereby relating the importance of productivity on the general output on the end product; and
- More so, effective measures should be put in place through proper planning activities to ensure that all project achievable are delivered within the limited resources available.

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APPENDIX

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

COLLEGE OF ARCHITECTURE AND PLANNING

DEPARTMENT OF BUILDING TECHNOLOGY

MSc CONSTRUCTION MANAGEMENT

ASSSESSMENT OF PRODUCTIVITY MANAGEMENT PRACTICES ON GHANAIAN CONSTRUCTION SITES

(Tick where applicable)

A. Background of respondents

1. Position in Company?

   [a] clerk of works [b] site engineer [c] Trade Foreman [d] Operations manager [e] construction manager

2. How many years have you spent in the company?

   [a] 1 -5 yrs [b] 6 – 10 yrs [c] 11 – 15 yrs [d] 16 – 20 yrs

3. What is your highest level of education?

   [a] Junior High School [b] Senior High/Technical [c] Polytechnic [d] University

B. Background of Company

4. Company's years of existence?

   [a] 1-5yrs [b] 6 – 10 yrs [c]11 -15yrs

5. Classification of Company based on Ministry of Water, Works and Housing?

   [a] DIKI [b] D2K2 [c] D3K3

6. How many staff do you have?

   [a] 1-10 [b] 20 – 30 [c] 31 – 40 [d] 41 – 50 [e] 51 and or more

7. How many of the staff are skilled labour?

   [a] 5-15 [b] 16 – 25 [c] 26 – 35 [d] 40 and or more

8. How many of the staff are permanent workers?

   [a] 0 – 5 [b] 6 – 15 [c] 16 – 25 [d] 25 and or above

C. Productivity

9. Is there any productivity policy in the firm?

   [a] Yes [b] No

10. If yes, who is responsible?

    [a] Site Engineer [b] Trade Foreman [c] Tradesmen [d] operations manager

11. When is the policy implemented in the project phase?

    [a] Feasibility stage [b] During actual construction [c] Post construction stage

12. Is there any standard labour output for the company?

[a] Yes [b] No

13. Has your firm undergone any productivity measurement activity before?

[a] Yes [b] No

14. If Yes, how did your firm measure productivity?

[a] Against estimates [b] against labour output [c] against other projects

15. Which measurement tool is adapted by the firm?

[a] Method study [b]Work measurement [c] Both

16. Why did your firm measure productivity? (tick as many as applicable)

[1] Strongly disagree [2] Disagree [3] Quite Agree [4] Agree [5]Strongly Agree

Reasons for productivity measurement	**1**	**2**	**3**	**4**	**5**
Eliminate waste					
curb construction delays					
increase output					
motivate workers					
Improve Company's performance					
Others					

17. Rank the factors affecting productivity in your firm according to the measurement under-taken?

    [1] Strongly disagree [2] Disagree [3] Quite Agree [4] Agree [5]Strongly Agree

Factors Affecting Productivity	**1**	**2**	**3**	**4**	**5**
Plant and Equipment					
Inadequate communication					
Labour Force					
Materials					
Site organisation					
Inadequate supervision					
Worker motivation					
Government policy					
Others					

18. How did your firm tackle these challenges, rank them according to the strategies adopted by your firm?

    [1] Strongly disagree [2] Disagree [3] Quite Agree [4] Agree [5]Strongly Agree

Ways of improving productivity	**1**	**2**	**3**	**4**	**5**
Introduced modular construction					
Introduced Just-In-Time (JIT)					
Improved health and safety					
Proper site layout					
Proper materials handling					
Proper planning of project					
Good communication channels					
Motivation					
Setting targets for workforce					
Other					

THANK YOU