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Analysing Factors that Correlates Labour Productivity of Operatives in the Ghanaian Construction Industry

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Abstract

As a result, a questionnaire was developed and administered to project managers of selected construction companies. The PCA extracted four factors namely, quality leadership, communication, motivation and experience supervisors. The analysis revealed that, among 28 critical factors, the 4 extracted factors had great effect on operatives' labour productivity. This has implications for designing managerial strategies for improving labour productivity since the extracted factors are all managerial related factors. Based on the findings, the study has made recommendations for improving the productivity of site operatives in Ghana. Recommendations have also been made for further research.

Keywords: Labour Productivity, Site Operatives, Constructions Management

1.0 INTRODUCTION

Globally, labour has been found to account for a third of the total direct capital cost of construction projects (Mac Tague *et al.,* 2002; Thomas et al., 2003; Akindele & Adebo, 2004). Hanna et al., (2005), also propounded that the cost of labour in construction industry is estimated to be about 33%- 50% of the entire project cost. In the construction industry productivity loss is one of the greatest and severe problems. Example, when workers embarked on strike action or lay down their tools, the result is a decreased in labour productivity. A decrease in productivity is an increase of labour cost. Impliedly, an increase in productivity can reduce the labour cost in a direct proportion. It can either benefit or reduce a project's profit, and that making it vital importance to the construction industry (Hanna et al., 2005). The antecedents of low productivity or high productivity have been established by a number of researchers. As mentioned earlier, in the construction industry productivity loss is primarily a serious problem. Currently, construction contracts lack enough to classify recompense for productivity loss due to field factors (Construction Industry Institute [CII], 2000; National Electrical Contractors Association [NECA], 1989). Since labour is more variable and unpredictable than other project-cost components, it has become essential to understand the effects of determinants of labour productivity. Preceding research confirmed that productivity loss results from diverse factors, which includes but not limited to various variation in drawings, long hours of extra work, poor field management, and extreme climatic conditions (Alarcon & Borcherding, 1991; Leonard, 1987; Sanders & Thomas, 1991; Thomas & Oloufa, 1995).

It is not only these; other determinants or factors underpin low productivity. As mentioned earlier, the labour front in Ghana is often characterized by industrial strikes in demand for improved working conditions. If workers in the construction industry embark on strike action or lay down their tools, it is likely to cause reduction in productivity and time overruns which in effect will cause labour, and material cost to increase when there are delays due to labour strikes. Studies by Borcherding and Oglesby (1974), showed increase construction cost because mostly construction projects have deadlines to meet with cost penalties attached. Mbachu and Olaoye (1999), also discovered that Nigerian construction industry is bedevilled by projects that complete much longer than they are mutually planed. It has become extremely important or necessary to improve the productivity of labour in the Construction Industry in Ghana. Firstly, the construction industry is an important economic sector. Secondly, increasing labour productivity will lead to growth of the construction sector and also affect other related sectors. Thirdly, labour is a resource in construction industry. Finally, there is little study/research on construction labour productivity in developing countries, particularly Ghana. Thus the reason it has become extremely important to find out the determinants that affect the construction labour productivity of operatives.

The construction industry plays an important role in any economy and its activities are also vital to the achievement of socio-economic development goals of providing shelter, infrastructure and employment (Anaman & Amponsah, 2007). It is worth noting that one of the main agenda of the Millennium

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Development Goals (MDGs) and The Ghana Poverty Reduction Strategy II (GPRSII), is to address human development issues of which, Cotton et al., (2005) noted that the agenda is achievable by the provision of infrastructure for services and employment through the construction industry, if productivity on construction sites are improved to promote and sustain efficiency. Furthermore, increasing labour productivity will lead to growth of the construction sector and other related sectors of the national economy. These and many reasons make it extremely important to find out the determinants that affect the construction labour productivity of operatives.

Despite the above facts, there is very little research work on determinants that affect labour productivity (Construction Industry Institute [CII], 2000; National Electrical Contractors Association [NECA], 1989). The onus, therefore, lies on construction managers to improve productivity of workers on construction projects by making sure that, supervisors at all levels are sufficiently skilled in handling tasks (The Business Roundtable, 1989). There is therefore the need to identify the determinants that affect labour productivity in relation to the construction industry and manage them to improve productivity among workers.

2.0 LITERATURE REVIEW

2.1 Methods used in Productivity Measurement

This sub-heading is meant to explain in simple language the concept of productivity and methods used in measuring it, arithmetically. It also brings to fore some popular misconceptions about productivity, by distinguishing between labour productivity and total factor productivity, efficiency and effectiveness. There are many different measures of productivity and productivity growth (Horner &Talhouni, 1998). The choice of a particular measure is dependent on the purpose of the productivity measurement. But in many instances, choice of one measure over another depends on the availability of data. In broad terms, productivity measures can be categorized into two. The first classification covers the number of production factors that are considered in the measurement of productivity and it is based on the notion that different input measures result in different productivity measures.

Single Factor Productivity Measures; Single-factor productivity refers to the measurement of productivity that is a ratio of output to one input factor. It is also referred to as partial measures of productivity. A most well-known measure of single-factor productivity is the measure of output per work input, describing work productivity. These measures relate a measure of output to a single input or factor of production. An example of single-factor productivity measure is labour productivity which relates output to labour hours used in generating the output or capital productivity which also relates output to volume of capital consumed in the production of the output. These measures of productivity are also referred to as partial productivity measures.

Multi-Factor Productivity Measures; these measures relate a measure of output to a basket of inputs or production factors. Multi-factor productivity is sometimes referred to as total factor productivity even though there may be important methodological differences. In multi-factor productivity, several production factors are included as inputs, though not necessarily all factors. In total factor productivity all possible production factors are considered as inputs, though this is seldom the case. In practice, multi-factor indices of productivity relate output to the combined inputs of labour and capital. Thus MFP reflects the efficiency with which capital and lab our inputs are combined to generate outputs.

The second distinction is between productivity measures that relate gross output to one or several inputs or production factors and those which use the concept of value added to ascertain changes in outputs. Of the most frequently used MFP measures, capital-labour MFP relies on a value-added concept of output while capital labour- energy-materials MFP relies on a particular measure of gross output. The five most widely used productivity concepts stated by Attar, A. A., Gupta, A. K., and Desai D. B., (2011) in their findings about improving productivity are;

2.1.1 Labour Productivity, Based on Gross Output.

This productivity measurement traces the labour requirement per unit of output. It reflects the change in the input coefficient of labour by industry and is useful for the analysis of specific industry labour requirements. Its main advantage as a productivity measure is its ease of measurement and readability; particularly, the gross output measure requires only price indices on gross output. However,

since labour productivity is a partial productivity measure, output typically reflects the joint influence of many different factors (Attar et al., 2011).

2.1.2. Labour Productivity, Based on Value-Added.

Value-added based labour productivity is useful for the analysis of micro-macro links, such as an individual industry's contribution to economy-wide labour productivity and economic growth. From a policy perspective, it is important as a reference statistic in wage bargaining. Its main advantage as a productivity measure is its ease of measurement and readability, though it does require price indices on intermediate inputs, as well as to gross output data. In addition to its limitations as a partial productivity measure, value-added labour productivity has several theoretical and practical drawbacks including the potential for double counting production of benefits and double deflation.

2.1.3. Capital-Labour MFP, Based on Value-Added.

This productivity measurement is useful for the analysis of micro-macro links, such as the industry contribution to economy-wide MFP growth and living standards, as well as, for analysis of structural change. Its main advantage as a productivity measure is the ease of aggregation across industries. The data for this measurement is also directly available from national accounts. The main drawback to the value-added based capital-labour MFP is that it is not a good measure of technology shifts at the industry or firm level. It also suffers the disadvantage of other value-added measures that have been double deflated with a fixed weight as quantity index (Attar et al., 2011).

2.1.4. Capital Productivity, Based On Value-Added.

Changes in capital productivity denote the degree to which output growth can be achieved with lower welfare costs in the form of foregone consumption. Its main advantage as a productivity measure is its ease of readability but capital productivity suffers the same limitations as other partial productivity measurements (Attar et al., 2011).

2.1.5. KLEMS Multi-Factor Productivity

KLEMS-MFP is used in the analysis of industry-level and sectoral technical change. It is the most appropriate tool to measure technical change by industry because it fully acknowledges the role of intermediate inputs in production. Domar's aggregation of KLEMS -MFP across industries renders an accurate assessment of the contributions of industries to aggregate MFP change. The major drawback to KLEMS MFP is its significant data requirements, in particular timely availability of input -output tables that are consistent with national accounts. It is also more difficult to communicate inter industry links and aggregation across industries using KLEMS-MFP than in the case of value-added based MFP measures (Attar et al., 2011).

There are varied methods used in the measure of labour productivity and these include the project level information systems, direct observation methods, and survey/interview based methods (Thomas, 2000). Each method is geared towards measuring certain aspects of construction production and complementing each other. Project level information systems, such as electronic cost reports and unit rate reports, are used to measure the input and output in construction productions, thus leading to generating productivity measures such as worker hour per output quantities. Such systems from this standpoint can only reveal issues pertaining to the global outcome in production, even right from the industrial economics, not to talk of labour economics.

According to Oglesby *et al.,* (1989), the information gathered through the above three methods are then used to support productivity improvement decision making, which completes a typical framework of productivity measurement for improvement in the construction industry. The issue is that this productivity measurement framework does offer possible solution to improve onsite productivity, one of the major limitations is that most of these techniques or methods are manually intensive, resulting in relatively outmoded information and expensive data collection systems (McCullouch 1997; Cheok *et al*., 2000). For example, because of the manual efforts required in input and output quantity gathering, the productivity information in the project level information systems is often slowly updated (every one to two weeks), leaving such systems only as unsuitable for the purpose of small scale project but macro project control,

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such as cost tracking, and unrealistic for supporting rapid response to problems that result in low productivity in on-going projects. The same limitations apply to other methods in this productivity measurement framework.

2.2 Misconceptions about Construction Productivity

Time and again the concept of productivity is confused with several related but distinct concepts. To uphold a clear view of the productivity concept requires that these misconceptions be dealt with decisively. A study done by Adrian (1990) states the following general misconceptions about labour productivity: Key factor for low productivity in construction industry is labour. Because the construction industry is controlled by the weather, productivity cannot be improved. The construction industry always has an unfavourable relationship process. Yet there are several of such misconceptions in the construction industry. One of such is the probability for people to equate productivity to labour efficiency or labour productivity. While labour continues to be key production factor, it is just one of the numerous production factors that go into the production of goods and services (Adrian, 1990).

The second source of confusion arises out of the notion of factor intensity. Many people have tended to construe productivity to mean a more intensive use of capital or resources such as labour and machines. Productivity refers to a more intelligent or prudent use of resources which will result in effectiveness and efficiency. For that matter, more output can be produced either with the same or fewer resources. Factor intensity; on the other hand, mean getting more resources into production. For this instance, the resulting increase in production or output is accredited to the increase in resources used and not the efficient use of resources. In relating to labour, it can be said that improved labour productivity is achieved by working intelligently and not by working harder (Adrian, 1990).

A third major misconception about productivity is the use of rising or declining output to measure improvements or declines in productivity. A rising output might not automatically mean productivity is enhanced, just as declining output might not necessarily be due to drop in productivity. If the rising output is as a result of putting more inputs into production (i.e., if costs of inputs have risen disproportionately) the productivity ratio will also remain unchanged or it might even decline. There is also the chronic confusion between productivity and profitability. It is often assumed that increase in profit signify improvement in productivity, in like manner a decrease in profits imply that productivity has gone down. Higher productivity might not always lead to higher profit. Surely, profits will actually go down if what is efficiently produced is not in demand or its price falls totally due to isolated factors such as changes in weather pattern. It is also true that rising profit does not mean that there are improvements in productivity.

A fifth misconception relate to the difference stuck between productivity and efficiency. Efficiency refers to the production of quality output at a bare minimum cost. It is the value of output relative to the cost of inputs used in the production process. But while productivity refers to the quantity of output (regardless of value) that is produced from a given quantity of resources. In this sense, productivity is said to have increased or improved when the quantity of output increases relative to the quantity of inputs. Efficiency, however, is said to improve when the cost of inputs used is reduced relative to the value of output. It is therefore possible to improve efficiency without improving productivity. A change in the relative price of input might induce a firm to change its inputs mix as a way to reduce its input cost. A reduced input cost relative to value of output helps the firm to improve its efficiency without actually increasing the quantity of output relative to the quantity of inputs (productivity).

A sixth misconception has to do with the notion that productivity is applicable only to production of tangible goods. Behind this confusion is the apparent difficulty of measuring productivity in areas such as services. However, despite this apparent difficulty of measuring productivity in certain spheres of human activity, productivity is relevant for all organizations. It is also measurable in all organizations and activities including services and even the military. For this reason, some have defined productivity as a state of mind and attitude that seek the continuous improvement of what exists. It is a conviction that one can do better today than yesterday and that tomorrow will be better than today.

Last but not least of the misconceptions is the very important mistake that organizations can achieve productivity gains or improvements in productivity simply through costs-cutting measures. Combined with the notion that productivity is equivalent to labour productivity, managers and

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policymakers have frequently focused on cutting labour costs as a way to improve their productivity. While it is true that productivity can be improved by reducing input cost, indiscriminate cost-cutting can in the long term be counter-productive.

2.3 Productivity in the Construction Industry

It is now obvious that productivity improvement is the quickest and most sustainable way out of poverty and underdevelopment. Productivity growth is also recognized as the sustainable way to transform lives caught up in deprivation and improve living conditions particularly in the context of prevalent depletion of global resources. The socio-economic situation in Sub-Sahara Africa is characterized by widespread poverty and deprivation. Majority of the people receive low incomes, and have limited access to quality healthcare and education as well as decent housing. Majority of Sub-Sahara African countries in warm climates are faced with a challenge of meeting their foods needs with many going hungry at night. In spite of the fact that the sub region is home to considerable amounts of natural resources in the world, poverty level is still high.

World food Organization gives a lot of food-aid to most of these countries (World Food Organization, 2011). In the age of globalization where other regions of the world are growing their economies and lifting millions of its citizens out of poverty, many countries still wallowing in intractable poverty due to climatic conditions, and many more at risk of becoming poor. There are deficits of decent jobs but blue-collar jobs (construction work), and the low productivity from workers who got the jobs inversely determine the wages they are paid, not even a 'take home wage', then ask of living wage. Yet, construction activities have the potential to generate incomes even in isolated communities, hence its ability to alleviate poverty. Construction is one of the largest industries and contributes to about 10% of the gross national product (GNP) in industrialized countries (Navon, 2005).

The desire to improve labour productivity in the construction industry has been increased over the last two decades. Increase of productivity was calculated prior to mid-1906's, in the construction industry (Stall, 1983). Literature shows a lot of research has been done in the developed economies, sadly the same cannot be said of developing countries in the Sub-Sahara Africa, even Ghana. According to Prokopenko (1987), "Productivity is the only important world-wide source for economic growth, social progress and improved standard of living". Productivity is then defined by Borcherding and Liou (1986) as a ratio between an output value and an input value used to produce the output.

This output consists of products or services, and the input consists of materials, labour, energy, etc. Despite much study has been conducted on identifying the factors that influence productivity, the problem of low productivity levels still persists even in UK construction, not to mention countries in Sub-Sahara Africa (see Latham, 1994 and Egan, 1998). The decline in productivity has remained a nerve-racking issue in the construction industry all over the world. A study by Thomas and Kramer (1988) said in 1968, the Construction Roundtable was established due to concern about the increased cost of construction ensuing from an increase in the inflation rate and a significant decline in construction productivity. A review of previous productivity research found a significant lack of studies that investigated contextual influences that could truncate productivity loss. Instead, past research relied on quantitative survey, mainly from a managerial point of view, which was inadequate to tackle a complex phenomenon like labour productivity.

2.4 Determinants of Labour Productivity

Undeniably, it was known that careful adaptation would be required to implement the knowledge and experience gained in the manufacturing industry to the building construction industry (Alarcon and Borcherding, 1991). Research has shown a number of factors that affects productivity are still anonymous which need to be further studied even in developed countries (Makulsawatudom and Emsley, 2002). In Senegal, Mbaye (2002) found a deep fall in productivity over the period studied relative to other countries, whilst in Zimbabwe there was no growth in total factor productivity throughout the period of economic adjustment (Bjurek and Dureval, 2000). Ameh and Odusami (2002) recognized low wages, lack of materials and unfriendly working environment as having key impact on productivity of craftsmen engaged in in-situ concrete operation in a single storey building project in Nigeria. Laufer and Moore (1983) opined that, financial incentive programmes could be used to increase construction labour productivity. Whilst

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Enshassi*et al.,* (2007) also identified in their study in the Gaza Strip, five most important factors that impact negatively on labour productivity as material shortages, lack of experience of labour, lack of labour surveillance, and alteration of drawings/specification during execution. Similarly, Makulsawatudom *et al.,* (2004) also established 10 most significant factors affecting construction productivity in Thailand and they include lack of materials, incomplete drawings, incompetent supervisors, lack of tools and equipment, absenteeism, poor communication, instruction time, poor site layout, inspection delay and rework. Groák, (1994) argued that 'the notion of the dominance of the project changes the ideas or redirects the thought on what we focus for productivity improvements' (p. 290).

In the construction industry, one of the greatest challenges faced by project managers is how to identify and evaluate factors affecting construction labour productivity. Factors such as low morale, poor supervision, poor training, and unsafe working conditions are generally related to worker motivation, which are intrinsic. A great deal of research has been carried out on the factors that motivate construction workers (Borcherding and Oglesby 1974; Borcherding et al.1980; Borcherding and Garner 1981; Maloney 1983; Maloney and McFillen 1985, 1986). Summaries of these factors are also available (Warren 1989). Other studies have shown the effect that management (starting with the foreman) can have on crew performance. For example, a survey of 703 construction workers showed that foremen have "a strong impact on worker motivation, performance, and satisfaction" (Maloney and McFillen 1987). The relationship between productivity and foremen's management style has also been recognized (Hinze and Kuechenmeister 1981; Emna et al.1986). Another study found "poor supervision poor planning, and generally poor management" to be major causes of absenteeism and turnover ("Absenteeism" 1982).

Furthermore, to understand and being conscious of critical factors affecting productivity is important, whether it affects productivity positively or negatively, because it can be used to prepare a plan or strategy to reduce inefficiencies and to improve the effectiveness of project performance. Enshassi*et al.* (2007) observe thatdespite the rigorous investigations made into the factors affecting labour productivity, researchers have not globally settled on a collective set of factors with significant influence on productivity; or any agreement reached on the classification of thesefactors. The authors however, group factors affecting construction labour productivity under ten headings, namely: manpower, leadership, motivation, time, materials/tools, supervision, project, safety, quality and external. Kazaz et al. (2008) consider productivity factors under four groups namely; organizational factors, economicfactors, physical factors and socio-psychological factors based on the theory of motivation. Durdyev&Mbachu (2011) consider key constraints and improvement measures for on-site labour productivity using 56 sub-factors.

The factors were identified under eight broad categories of internal and external constraintsnamely: project management/project team characteristics, project finance, workforce,project-related factors, unforeseen events, technology/process, statutory compliance and other external factors. Odesola (2012) identified 75 factors affecting construction labour productivity from literature and focus groupdiscussions with masonry artisans and projectsupervisors/engineers. The declining rate of productivity and lack of productivity standards are the main problems of the construction industry. However, determinants of labour productivity in construction have been identified and classifiedby the author under 5 headings;

- Managerial related factors
- Technical / Technological related factors
- Labour union related factors
- Biographical variables related factors and
- External related factors.

2.5 Managerial Related Factors

The presence and supervision of management at a construction site is very essential for improving productivity (Thomas, 1991). The foundation of all job improvement efforts is management recognition of employee's desire to do good job, to take responsibility, to achieve and to succeed. Edwards and Love (2007); Love et al. (2005) conducted a research related to factors affecting productivity and came out with problems of rework and worker's performance and motivation affecting productivity in Australia. The United Nations Committee on Housing, Building, and Planning in 1965 conducted a research concerning

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the effects of repetition on building operations and processes. It discovered the necessity for a rise in productivity was perhaps more severe in the construction sector compared to any other sector. It was necessary to implement, as far as possible, industry-wide principles of production throughout the construction process (UNC, 1965). The greatest boost or threat to productivity improvement comes from how management perceive workers who are often considered the most vital asset of every organization and the kind of communication that develops from such observation.

Thomas et al., (2002) identified the main performance criteria of construction projects as financial stability, progress of work, standard of quality, health and safety, resources, relationship with clients, relationship with consultants, management capabilities, claim and contractual disputes, relationship with subcontractors, reputation and amount of subcontracting. Chan and Kumaraswamy (2002), also propane that interpersonal relation is one of bottle neck of productivity. Chan et al., (2002) goes on to say that construction time is increasingly important because it often serves as a crucial benchmarking for assessing the performance of a project and the efficiency of the project organization. Some conservative estimates put management directly in charge of about two-thirds of productivity gains (Prokopenko, 1960). If management subscribe to Theory X, it implies that managers need to direct and control workers, and then a fertile ground is laid for declining productivity. According to Theory X, workers are 'economic animals' who are only interested in money, they are lazy passive, have little or no ambition, they prefer to be led and they will always resist change. Theory X (of which Taylorism or Scientific Management theory forms part) stresses the use of coercion, tight controls, threats, and punishments.

McGregor (1960) warned that such management styles always result in low productivity, antagonism, militant unions, subtle sabotage and disloyalty. Moreover, such management styles cause individuals to pullout or withdraw from the organization (psychologically) and through chronic absenteeism and or high labour turnover. The result is low productivity. McGregor went ahead criticising the popular management view and style and recommended what he called Theory Y. This theory accepts the basic suggestion that management is responsible for the organization of work in the company but it stresses that workers are not economic animals as Theory X suggests. According to Theory Y, the task of management is to organize work and make conditions at the workplace in such a way that workers' efforts can be directed towards organizational goals. In other words, management should organize work in such a way that goals of organization and individual goals will coincide (Bolman& Deal, 1991). Impliedly (Fugar & Agyarkwa-Baah, 2010) found out that equipment, materials, finance related, environmental related, changes, government action, contractual relationship, scheduling and controlling techniques as the factors influencing performance in the Ghanaian construction industry.

A number of studies have been carried out to look at factors impacting on project performance in developing countries. Faridi and El-Sayegh (2006) discovered that shortage of skills of manpower, poor supervision and poor site management, unsuitable leadership, shortage and breakdown of equipment among others contribute to construction delays in the United Arab Emirates. Hanson, Mbachu and Nkando (2003) examined causes that leads to low productivity and client dissatisfaction in the South African building industry and established that conflict, poor workmanship and incompetence of contractors to be among the factors which negatively impact on project performance. Mbachu and Nkando (2007) again found that quality and attitude to service is one of the key factors constraining successful project delivery in South Africa.Furthermore, Herbsman and Ellis (1990) explicitly recognized two strains of what they called 'construction productivity influence factors' and broadly grouped them into technical and administrative, the former defined as design related and deterministic and the latter as management related and stochastic. These goes to affirm that management role is vital in influencing work content element of construction labour productivity.

Construction projects are unique in every aspect, from the nature and layers of the starter, design, environment, and demography of the workforce, and all these have impact on the project, and labour productivity also brings challenges with its complexities to the managers of the project. It is therefore essential for the project managers to have a controlling hand over the job to avoid rework and double handling. Logcher and Collins (1978), gave basic understanding about major factors of managerial approach and stated "What is needed is a basic knowledge of how major factors of a management strategy, divorced from means, methods, materials, and job conditions, independently affect labour." A study by Makulsawatudom and Sinthawanarong(2004) confirmed that rework is one of the major factors

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in the construction industry that affect labour productivity in construction industry. The study also listed rework as one of the critical factors effecting productivity and said that rework is due to incompetent craftsmen and supervisors. Given that there is an association between productivity and skills, it is important that construction project managers and contractors have a fair knowledge of the methods leading to the evaluation of productivity of equipment and labour, in the various crafts (Shehata et al., 2011) also, Iyer and Jha (2005) inferred that skills and quality of leadership affects strongly and directly on productivity or performance of construction project. As they bemoaned, "If project managers have strong leadership skills, the project performance can be monitored, controlled and managed with high quality".

2.5.2 Technical/Technological Related Factors

Working harder is not the key to improving productivity, but working smarter by using technical and technological innovation, and proper organization of work. Technology has a potential of improving productivity in two major ways: (1) reducing labour by input by automating many manual operations and (2) reorganizing or enabling improvements in work processes. Technology is one of the most important factors in construction industry. According to Sundaraj (2006), a construction process demands heavy exchange of data and information between project participants on a daily basis. Research has shown that theories of technological innovation have room for improving the construction process (Widén, 2002). Based on the research done by Ofori (1991), training for construction industry in developing countries is generally contributed to the performance and effectiveness of both employer and employees.

In a relatively recent research attempt, Triplett and Bosworth (2004) identified that much of the nation's productivity growth could be attributed to improved production of technology, increased competition due to globalization, and changes in workplace practices and firm organizations. Training is vital to the developing countries because efficient manpower planning and development plays a crucial role in support of a flexible and dynamic labour force, coping with the fast technology transfer and industrial growth. Sexton and Barrett (2003) acknowledge that although construction firms have always demonstrated an ability to innovate, construction practitioners are now very much getting grasp with the need for and management of technological innovation as a clear-cut venture. The United Kingdom construction industry by way of example is increasingly being challenged to productively innovate in technology in order to satisfy better aspirations and needs of society and clients, and improve competitiveness (Latham, 1994; Egan, 1998).

The Ghanaian construction industry and the construction industries in other developing countries should likewise aim at being more innovative in technology in ordertoput up good job to satisfy the client's needs. It follows that labour productivity can be improved, especially in the situation of third world countries, with an increase in activities that support technological innovation. Technological innovation plays a pivotal role in improving labour productivity and developing new products and services, and in providing relative and complete advantages (Dodgson, 2000). In this era of power driven tools and equipment, operative's productivity has changed. Intangible investment in new knowledge and its dissemination are vital elements to productivity improvement than physical investments in bricks and machines (Freeman & Soete, 1997). According to Porter, 1987; Freeman and Soete (1997), it is generally accepted that technological innovation in manufacturing firms is one of the main reasons for industrial competitiveness and national development.

Productivity of operatives can be affected if required technological approach is not applied, also when tools and construction equipment for specific jobs are not available at the correct location and time. Inefficiency of equipment and technological gap are factors which cause low productivity. The productivity rate of inefficient equipment is generally low. The machines like bulldozers must be strong enough to save cost of repairs and frequent breakdowns. Therefore, it is essential for site supervisors to be familiar with the characteristics of the major types of equipment most commonly used in construction for efficiency. Usually old equipment is subject to a vast count of breakdowns, and it takes a long time for the labourers to complete the work, thus reducing productivity. Technology is such an important factor, hence the new way of working through the robotic technology helps workers to finish task in short period of time. For new and efficient ways of doing things technically, it is essential to select the appropriate tools and methods. Other technical problems like inadequate designs or incomplete engineering work can also lead

to backlog in productivity of the operatives. Similarly, restrictive and redundant procedures also affect the effectiveness of projects (Dozzi&Abourizk, 1993).

In order to increase job-site productivity, it is beneficial to select equipment with the proper characteristics and a size most suitable for the work conditions at the construction site. Labourers require a minimum number of tools and equipment to work effectively to complete the assigned task. If the improper tools or equipment is provided, productivity may be affected (Alum & Lim, 1995; Guhathakurta& Yates, 1993). The size of the construction site and the material storage location has a significant impact on productivity because labourers require extra time to move required materials from inappropriate storage locations, thus resulting in productivity loss (Sanders & Thomas, 1991). According to Tucker *et al.,* (1999), lack of technical and managerial skills is often identified as one of the major problems of contractors in developing countries resulting in poor competitiveness with their well-developed and industrialized counterparts.

2.5.3 Trade/Labour Union Related Factors Labour to Productivity.

A trade union or labour union is a group of workers who have united together to achieve common goals such as protecting the integrity of its trade, achieving higher pay, increasing the number of employees an employer hires, and better working conditions. The trade union, through its leadership, bargains with the employer on behalf of union members and negotiates labour contracts (collective bargaining) with employers. The main purpose of these associations or unions is "maintaining or improving the conditions of their employment". According to a study by (Webb, Sidney; Webb&Beatrice,1920) this may include the negotiation of wages, benefits, work rules, complaint procedures, rules governing hiring, firing and promotion of workers, workplace safety and policies. Workers in Ghana came together under a united trade union movement, to secure social, political and economic justice and to support the efforts of affiliated unions to improve wages, shorten hours of work and create better conditions of service at work places. And also assist affiliated unions to undertake collective bargaining on behalf of workers and, finally to support the promotion of work efficiency and improve productivity at work places.

The construction industry in Ghana is dominated by the members of Construction and Building Material Workers' Union (CBMWU). Construction and Building Material Workers' Union (CBMWU) is an affiliate to the Trade Union Congress in Ghana with other 17 affiliated unions. The CBMWU was formed in 1954. It organizes workers mainly from the building, stone weaning, and road construction (including the chipping and gravel production). The union has suffered membership decline since the 1980s due to the privatization of state-owned enterprises which was a condition of Structural Adjustment of the International Monetary Fund (IMF). The privatization of state-owned enterprises resulted in massive retrenchment exercise which wiped out a large section of the formal segment of the construction sector, especially in the State Housing Co-operation (SHTC). Since then the membership of the union has continued to decline mainly because of the excessively large share of redundant formal sector workers in the construction industry.

Construction Labour productivity in the context of Trade union, yields of productivity should evenly disbursed even to the least operative, no wonder its growing demand for living wages, employee involvement in the job to gain respect and make profit, which at the end of the day would lead to higher yields and workers may enjoy bonuses, incentives and higher wages. The union brings employers and employees on an equal footing, pedestal or platform for an agreement and bylaws that collectively bind both parties. The union initiate support with the notion of embracing differences of perspectives to bridge the wide gap between (white-collar) managers and (blue-collar) operatives' involvement in the job which could lead to the attainment of higher productivity levels on-site. This concept of employee involvement in decision taking in manufacturing and construction industries is not new; it started in the mid-19th century in response to the social and economic impact of the industrial revolution. It started when coal mine workers united for a common goal; to fight for the reduction of man hours and to improve the working conditions. It has been around in the UK in various instances over the last century. According to Marching ton and Wilkinson (2002), the concept evolved from the days of collective bargaining at the end of the First World War to the growing interest in industrial democracy in the 1970s to management-driven employee

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involvement schemes that stressed direct communication with individual employees. Talking about employee involvement goes with union laws and regulations with employers and these varies from country to country, as does the function of unions. For example, German and Dutch unions have played a greater role in management decisions through participation in corporate boards and co-determination than have unions in the United States.

Moreover, in Ghana, and the United States, collective bargaining is most commonly undertaken by unions directly with employers, whereas in Austria, Denmark, Germany, or Sweden, unions most often negotiate with employers' associations (Bamberg & Ulrich, 2004). Generally speaking, there are five major substantive issues which are in mind of the workers' quest in coming together. These are wages and other material remuneration, job security, working conditions, working time and, respect and dignity. In other words, 'Trade Unionism' is a drive, that quest for improvements in these substantive issues mentioned. This drive led to the formation of trades unions. According to Baba Aye (2010), the spectrum of this systemic conception of trade unions extends from the unitary, to the "limited intervention" of "guided democracy". Examples of the former would be clearly corporatist states/social systems such as those of fascist Germany and Italy, Stalinist USSR and the East bloc, the Estado Novo in Brazil, and the post-colonial one-party states in Ghana, Zambia and Tanzania.

Looking at the unionized workers and their involvement accrued much benefit and expected to extend beyond productivity gains to include improved employee attitudes and commitment (Wagner, 1994). This improvement is manifested as a result of their involvement, and in a sense of pride either through raising the status of operatives in problem-solving in the site or working cooperatively towards achieving a common goal. Thus, this study echoes similar studies into the effects of embracing employee voice (Marchington*et al.*, 2001). There is not anything more dangerous to any economy than a dwindling of its labour productivity, it creates inflationary pressure, social conflict and mutual suspicion (Drucker, 1980). Trade unions are interested in productivity improvement in the construction industry because it is one effective way by which they can achieve their ultimate goal of enhancing the living standards of not only their members but the living standards of all workers and families. But studies have shown that productivity improvement and the net wealth creation associated with it do not automatically lead to improved living standards for workers and their families. This is because productivity gains have often coincided with rising inequality, meaning that the gains from improved productivity are often not equally shared among those who generated the gains. For improvement in productivity to benefit all, including operatives and their families, the gains from productivity have to be fairly distributed. In a situation where few people at the top are awarded with a disproportionately large share of the net wealth while operatives are allocated small fraction of the gains, improved productivity will not translate into improved living standard for operatives and their families. For this and many other reasons, unions should not only be interested in measures to improve productivity but more importantly must also be interested in how the benefits of improved productivity are shared so that operatives will also benefit from their labour.

There is strong macro-economic and statistical evidence that say, the more effective or productive a nations' economy, the higher the personal income of its workers. At the company level when productivity is high the employer will have the ability to pay higher income. It is eminent that operatives will earn higher incomes from the productivity growth only when unions negotiate effectively. The unions will attain improved wages and salaries for their members and subsequently the dues the members pay will also be increased. The more productive an economy is, the more competitive that economy will be in the international markets and that will reduce the unemployment rate in that country. The more productive a company is, at the micro level, the more competitive it is in the economy and the more profits it can generate. If the favourable conditions are created for investments and the company ploughs back part of its profits in new investments, new jobs will be created through expansion of the company and unemployment will reduce. The social benefits of full employment of improved labour productivity are obvious.

Improving construction labour productivity, especially those that are pertinent to on-site labour, in the context of the growing importance of employee involvement, like the trade unions. This part of the research looks at trade unions involvement initiatives supporting the notion that embracing differences of perspectives between management and operatives in terms of dignity and respect, health and safety, job security, living wages, that lead to the achievement of high productivity levels on-site. Most countries

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around the world are still battling for these social benefits for economic and social interests, but the story is not the same in Ghana. Trade union rights, efforts and achievements in Ghana are enormous and stand high in Africa and the International Labour Organization. Trade union rights in Ghana are recognized by national legislation. Ghana rectified 50 ILO Conventions including the eight (8) core Conventions (Kalusopa, Otoo, &Shindondola-Mote, 2012).

Article 21 (e) of the 1992 Constitution of Ghana guarantees its citizens "freedom of association, which include forming or joining trade unions or other associations, national and international, for the protection of their interest" (Kalusopa *et al.,* 2012). Moreover, both Article 24 (3) of the constitution and Article 79 (1) of the Labour Act (Act 651, 2003) states that every worker has the right to form or join a trade union of his or her choice for the promotion and protection of their economic and social interests. Article 80 of the Labour Act further adds that "two or more people in the same undertaking may form or join a trade union". (Kalusopa *et al.,* 2012). However, clause 29 of the Act disallows managerial and supervisory staff from joining or forming a trade union. The Security and Intelligence Act of 1966 also exempts military and paramilitary personnel from joining or forming trade unions (Kalusopa *et al.,* 2012).

In Ghana, the Labour Act confers on trade unions the right to enter into collective bargaining with employers. Qualified trade unions must obtain a collective bargaining certificate from the Labour Department, to be able to bargain with employers on behalf of its members. This Labour Act established the National Tripartite Committee (NTC) which is made up of government, employers and organized labour. The NTC determines the National Minimum Wage (NMW) and advices government on employment and labour laws, international standards as well as industrial relations and occupational health and safety (Kalusopa *et al.,* 2012). Act 651 also established a National Labour Commission (NLC) made up of two representatives each from government, organized labour and employers. The Chairman of the Commission is jointly nominated by employers and labour. The NLC settles labour disputes through negotiation, mediation and arbitration without an option to court action. In the settlement of cases, the NLC has the powers of a High Court to put into effect the attendance of witnesses; and its decisions are binding on the parties (Kalusopa *et al.,* 2012).

Nonetheless, implementing these conventions and it associate legislations are sometimes confronted with a numeral challenge. Most of the times some employers (largely private employers) try to frustrate worker's effort to exercise their rights to unionisation and collective bargaining (Kalusopa *et al.,* 2012). One more significant challenge to collective bargaining is the inability to expand the benefits to the majority of Ghanaians clustered in the informal sector. Even though the National Minimum Wage (NMW) applies to all sectors of the economy, its compliance in the informal sector has been low. Non-compliance with labour standards particularly in the informal sector occurs due to lack of enforcement and monitoring. Numerous workers in the informal sector have little or no knowledge about the labour legislative framework in place (Kalusopa *et al.,* 2012).

3.0 RESEARCH METHODOLOGY

This study employed a quantitative approach. This was seen as appropriate in view of one of the study's research questions which seeks to find out the current practices use by contractors to improve productivity and to find out the factors that correlate labour productivity of operatives in the Ghanaian construction industry. The strength of the quantitative approach is that the research findings come from quantifiable data that are usually generalize-able to a larger population (Neuman, 2006).

3.1 Population

The population for the study is made up of a targeted group within construction companies namely; site Supervisors or site managers. General site foremen and headmen in construction firms of all categories belonging to the Association of Building and Civil Engineering Contractors of Ghana (ABCECG). According to Association of Building and Civil Engineering Contractors of Ghana, they hold a total membership of 1500 contractors in the country (ABCECG, 2013). The following figures were given by ABCECG for the regions; Greater Accra region- 127 contractors, Ashanti region - 48 contractors and Northern region-62 contractors. These three regions host many of the reputable construction companies operating in the country. The major cities in these regions are their administrative capital cities, and for

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that matter, Tamale has been chosen for Northern region, Kumasi for Ashanti region and Accra for the Greater Accra region.

Even though there are other mainstream associations of construction firms in Ghana, the firms in this association (ABCECG) is selected for the study because of its outstanding track record proven over the years and the international recognition it has attained. Secondly, it comprises of both building and civil engineering contractors. Thirdly, it covers both large and small scale contractors (D1, D2, D3 and D4 for general building contractors, K1, K2, K3 and K4 for civil engineering contractors).

Classification of construction firms in Ghana is done by the Ministry of Water Resources, Works and Housing (MWRWH). The D1, D2 and K1, K2 categories are classified as large scale firms and D3, D4 and K3, K4 are classified as the small scale contractors. According to the ministry's classification, the large scale contractors both civil and general building contractors are in the highest financial class. Though the small scale firms employ a large number of workers because small firm are spread throughout the length and breadth of the country, the large firms have relatively more organized managed labour force, and undertake large volumes of works.

The selection of data source is relevant for an academic research of this kind, instead of taking the list of up-to-date firms from the Ministry of Water Resources, Works and Housing, the researcher sort to use the list of firms from an association (ABCECG). In fact, Ministry of Water Resources, Works and Housing annual contract registration is not the most reliable data source available at present in Ghana. Simply because most construction companies are defaulting and not up-to-date in business because of competition, political affiliation, scarcity of contract and liquidity problems or for one reason or the other, they are not being able to renew their registration at the ministry. Secondly, a construction firm needs to register with the ministry to be qualified to bid for public works. When one is not registered, one can only bid for private jobs. These and many more make records of construction companies by the Ministry of Water Resources, Works and Housing incomplete.

3.2 Sampling Technique

The stratified random sampling and snow ball sampling was employed. Snow ball was used in the northern region because the researcher was not familiar with the terrain and have to fall on others for direction to construction sites. In fact, sample should represent all the properties of the population without any doubt. The main intention of stratified random sampling techniques was to collect representative samples from contractors in the two regions randomly. A suitable sampling technique is required to limit the study to a relatively small portion of the population.

3.3 Determination of Sample Size

The more accurately we expect the data to reflect the total population, the larger will be the sample size and more reliable and valid the results based on it will become (Bouma and Atkinson, 1995. Pp. 152-153). The total number of construction firms to be included in the study would be determined by the Kish equation; Kish (1965). Assaf *et al.,* (1999, 2001), Abdul-Hadi (1999) and Enshassi (2010), among others used this equation:

$$n = \frac{n'}{\left\{1+\left(\frac{n'}{N}\right)\right\}}$$ Where

n = Sample Size from finite population

N = Total Population

n´ = Sample Size from infinite population calculated from; $n' = S^2 / V^2$,

Where V = Standard error of sample population equal to 0.05 for the confidence level 95%, t = 1.96

S^2 = Standard error variance of population elements,

S^2 = P (1 - P); Maximum at P = 0.5.

The sample size of the contractors can be calculated from the afore mentioned equations as follows;

$$n' = \frac{S^2}{V^2} =$$

S^2 = P (1- P)

S^2 = 0.5 (1- 0.5)

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S^2= 0.5×0.5
S^2= P (1-P)
Where P = 0.5
S^2= 0.5 (1- 0.5)
S^2= 0.75

To find V^2, let V =0.05 level of confidence.

V^2= $(0.05)^2$
V^2= 0.0025
$\therefore n'$= $\frac{S^2}{V^2}$ = $\frac{0.75}{0.0025}$
n'= 300 answer
n contractors in Accra = $\frac{300}{\left\{1+(\frac{300}{127})\right\}}$ = 90 contractors
n contractors in Kumasi = $\frac{300}{\left\{1+(\frac{300}{48})\right\}}$ =42 contractors
n contractors in Tamale = $\frac{300}{\left\{1+(\frac{300}{62})\right\}}$ = 52 contractors

Assuming a non-response rate of 40%, a total of 1.4 x 184 will be required to be distributed. That is a total of 257 questionnaires will be required to be distributed. Presumably 40% non-response rate will do for unreturned or unanswered questionnaire, and all wasted questionnaires. The total questionnaires to be distributed in each of the three selected regions is summarized in Table 3.1.

Table 3.1 Number of questionnaires to be administered in the selected region

REGION	Greater Accra	Ashanti	Northern	Total
Number of questionnaires to be administered.	115	66	76	257

3.4 Data Collection and Procedure: The following instrument was used to collect data for the research:

Questionnaire: Structured questionnaires would be used to gather data for analysis. The questionnaires would be devised through the literature review having in mind the nature and character of the population. It would also be essential to provide straightforward questions to respondents to ensure a clear understanding of all the applicable definitions, procedures, strategies and guiding principles that would be used to collect the data. In order to enhance the study, after the literature review, a plan would be formulated for collecting field information and creating an evaluation process and numerical values.

3.4.1 Questionnaire

Questionnaires are used for the gathering of data. The questionnaires are prepared for the site supervisors of the Contractors who are members of Association Building and Civil Engineering Contractors of Ghana. As earlier mentioned, the questions are such that they contain elements to ravel labour related issues that impede productivity and profit.

3.4.2 Pilot-Test of Questionnaires

A pilot-test of survey questionnaire of an industry-wide research of this calibre is deemed important. The pilot-test is conducted to obtain feedback from practitioners in the industry. The pilot-test served largely to; 1) test the relevance of the constructs in Ghanaian construction context, 2) identify further constructs not captured from the secondary source (literature review), 3) to test the clarity and relevance of the questions, 4) modify the look and feel of the questionnaires and 5) to explore ways of improving the questionnaires appeal and response rate. The questionnaires were pre-tested by ten Mphil. Construction students. Response revealed the need to improve the clarity of a few questions. Part of the feedback received from the pre-test was the need to add "Uncertain" or "No idea" to the four-point rating

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system to five-point rating scale. This was to avoid any guesses from the participants who might not be clear about the question or not having the background knowledge of some particular constraints.

3.4.3 Validity and Reliability

This part presents tests of reliability of questionnaire according to the pilot study.One of the most commonly used indicators of internal consistency is Cronbach's alpha coefficient. According to Hair et al. (2010) and Straubs et al. (2004), the Cronbach alpha coefficient of a scale should be 0.7 or above. In the current study, the Cronbach alpha coefficient was0.978, indicating that the research instrument has high reliability, graded excellent. The reliability of an instrument is the level of consistency which measures the attribute it is supposed to be measuring (Polit& Hunger,1985). The less variation an instrument produces in repeated measurements of an attribute, the higher its reliability. Reliability can be equated with the stability, consistency, or dependability of a measuring instrument. The test is repeated to the same sample of people on two times and then compares the scores obtained by computing a reliability coefficient (Polit& Hunger, 1985). Chronbach's coefficient alpha (George and Mallery, 2003) is designed as a measure ofinternal consistency, and asked, do all items within the instrument measure the same thing? The normal range of Chronbach's coefficient alpha value between0.0 and + 1.0. The closer the Alpha to 1, the greater the internal consistency of items in the instrument being assumed. As the number of items (variables) in the scale increases, the value□□becomes large. Also, if the inter correlation between items is large, the corresponding □will also be large. Since the alpha value is inflated by a large number of variables then there is no set interpretation as to what is an acceptable alpha value.

The Chronbach's coefficient alpha was calculated for each field of the questionnaire. The most identical values of alpha indicate that the mean and variances in the original scales do not differ much, and thus standardization does not make a great difference in alpha. Table 3.2 shows the values of Chronbach's Alpha for each filed of the questionnaire and the entire questionnaire. For the fields, values of Chronbach's Alpha were in the range from 0.707 and 0.879. This range is considered high; the result ensures the reliability of each field of the questionnaire. Cronbach's Coefficient Alpha reliability estimate for the 93 labour productivity items was 0.978. Chronbach's Alpha value shows an excellent reliability of the entire questionnaire. In so doing, it can be said that the questionnaire is valid, reliable, and ready for distribution for the population sample.

Table 3.2 Chronbach's Alpha for each filed of the questionnaire

S/N	Field	No. of items	Cronbach's Alpha
1.	Managerial related factors	24	0 .943
2.	Technical/ Technological factors	12	0 .861
3.	Labour Union related factors	12	0.831
4.	Biographical variables factors	15	0.895
5.	External related factors	12	0.905
6.	Productivity	4	0.859
7.	Constraints	6	0.859
8.	Practices/Measures	8	0 .871
	Total	93	0 .978

3.4.4 Scale and Rating of Responses

The results were determined using mean value data based on the following rating scale: (1=Strongly Disagree, 2=Disagree 3=Uncertain/ No idea, 4=Agree, 5=Strongly Agree). Mean is a technique to compute the strength of index familiarity, frequencies and agreements of specific question. The data collected were analyzed using mean index which is used specifically for the ordinal scale measurement. The mean index can be computed by using the SPSS.

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All the key Determinants/factors related to operatives' productivity in construction were calculated and arranged based on the indication of mean response in the descending order and whichever values indicating near to one (1) will be considered as the highest entry modes decision of mean response. The mean response for mean value was allocated with the rating of 1.00 to 1.50 for strongly disagree, 1.50 to 2.50 for disagree, 2.50 to 3.50 for uncertain or no idea, 3.50 to 4.50 for agree and 4.50 to 5.00 as strongly agree.

3.4.5 Principal Component Analysis

The researcher intended use of the PCA is for the purpose of reducing the data to a bearable few for clearer presentation of results. This method is mostly used as a tool in exploratory data analysis and for making predictive models. Principal component analysis is closely related to factor analysis, and the factor analysis is a technique used to condense the information in a large number of variables into a smaller set of new, composite dimensions known as factors (Hair et al., 2011). Factor analysis typically incorporates more domain specific assumptions about the underlying structure and solves eigenvectors of a slightly different matrix. Principal component analysis can be done by eigenvalue decomposition of a data correlation matrix usually after mean centring the data matrix for each attribute. The results of a PCA are usually discussed in terms of component scores, sometimes called factor scores (the transformed variable values corresponding to a particular data point), and loadings (the weight by which each standardized original variable should be multiplied to get the component score).

In order to test for the appropriateness of using the PCA for the data, two tests were conducted, Kaiser- Meyer- Olkin (KMO) and Bartlett's test of sphericity. The KMO measure of sampling adequacy compares magnitudes of correlation coefficients to the magnitude of partial correlation coefficients (Malhotra and Dash, 2011). The value of KMO ranges from 0 to 1 and a minimum value of 0.5 is specified as an acceptable threshold for proceeding with factor analysis (Hair et al., 2011; Malhotra and Dash, 2011). The rotated component matrix is presented in Table 3.3. In the preliminary analysis, the Kaiser-Meyer-Olkin (KMO) test of sampling adequacy achieved a high of 0.938. The communalities achieved were also 0.80 or higher, indicating that the sampling size was reasonable enough for the factor analysis to proceed. In order to test for the appropriateness of using the PCA for the data, two tests were conducted, Kaiser-Meyer- Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity

In the present research, the KMO measure of sampling adequacy is 0.886 which is well above the acceptable value of 0.5 and is interpreted as 'meritorious'(Hair et al.,2011). The Bartlett's test of sphericity tests the factors that the correlation matrix is an identity matrix, which implies that the variables are uncorrelated (Chan et al., 2012; Field, 2005; Malhotra and Dash, 2011). The value associated with Bartlett's test of sphericity was large (approximate chi-square statistic=5.192E3) and the Bartlett's test is significant (p=.000), therefore factor analysis is appropriate (see Table 3.3).

Table 3.3: KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.886
Bartlett's Test of Sphericity	Approx. Chi-Square	5.192E3
	Df	378
	Sig.	.000

3.4.6 Correlation matrix

There was perfect positive correlative between the factors. The matrix shows perfect relationship, with r= +1 or a perfect negative relationship, with an r= -1 between any two aspects of the factors. Hence many of the factors have relationships such that motivation and skills are highly correlated at 0.797, with

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the exception of the 'job security' (see Table 4.18), which had low correlation of 0.184 with other factors especially 'nutrition and physique,' hence it was not included in the analysis.

The SPSS tool used advices that, any factor that correlates highly (for example r >0.8) should be eliminated from the investigation. A careful study reveals that there is none of the factors gone beyond 0.8, making a greater number of the factors moderately and highly correlated. Both tests used indicated factor analysis to be an appropriate technique for the present research. The variable 'job security' had very low correlation (.184) with the other variables especially 'nutrition' and hence was not included in the analysis

4.0 DATA ANALYSIS

4.1 Constraints to Labour Productivity

Table 4.10, presents the analysis of the subcomponents of on-site productivity constraints and majority of respondents strongly agreed that Governments influence on the construction process as a constraint to operatives' productivity at mean value of4.5167. This subcomponent constraints, has a variable which is related to a statutory compliance in Building Regulation Act (BRA) 1992.This statutory compliance makes a government's agency (MWHWR) the sole registrar of construction companies in Ghana. It compels the construction firms to be in bed with the government, or it would be difficult to win a bid to government project. When work goes down, workers are slapped off with redundancy. It implies that, contractors pay much to acquire projects and tend to under pay the operatives to make profit. In other words, they employ fewer hands for big projects. Perhaps, this could be the reason the operatives highly rated governments influence as a constraint to productivity.

The results show that out of the significant 6 variables measuring for constraint of productivity, respondent's response was high, as they agreed to all variables as barriers to productivity. The other constraints agreed by respondents at mean value of4.4833 which affect the productivity was the level of empowerment of operatives, giving training and, resource operatives with the necessary equipment, would influence productivity positively. The next constraint to labour productivity agreed by respondents at mean value of4.2667 was material related, acquiring materials from unreliable material source or supply. Respondents again strongly agreed at mean value of4.1500 that inspection delays by authorities negatively affect productivity, for that matter a constraint. These were followed by 'restrictive union contract has bad effects on labour productivity of site operatives', at mean value of4.1500 as indicated on Table 4.10. The variable EPA (Environmental Protection Agency) approval does delays progress of work and affects labour productivity being the key legislation affecting construction contracts and operations - was rated very low by majority of the respondents at mean value of3.7500.

Table 4.10Descriptive Statistics of Constraint to Labour Productivity

Variable	N	Min	Max	Mean	Std. Dv.
Government's influence on the construction process; political influence and Frequent changes in government policies/ legislations impact on construction productivity.	180	1.00	5.00	4.5167	.82878
Level of empowerment (training and resourcing) of labour force has a positive influence on productivity.	180	2.00	5.00	4.4833	.64708
Materials related (unreliable materials supply).	180	1.00	5.00	4.2667	.93115
Inspection delays by authorities negatively affect productivity.	180	1.00	5.00	4.1500	1.08043

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Restrictive union contract has bad effects on labour productivity of site operatives.	180	2.00	5.00	4.0500	.97611
EPA (Environmental Protection Agency) approval does delays progress of work and affects labour productivity.	180	1.00	5.00	3.7500	1.10800
Valid N (listwise)		180			

4.2 Productivity Related Factors.

In Table 4.11, pertaining to productivity related factors there are 4 variables, which were all highly scored by respondents. The respondents strongly agreed at the mean value of 4.5667 that an efficient worker would produce more units of work in less time. Secondly respondents strongly agreed again at the mean value of 4.5333 that an efficient worker carries out his work with high degree of workmanship. Respondents continued to agree on the third item that, a more committed worker would be productive. Then finally ended on this by strongly agreeing that an efficient worker will achieve set target at the mean value of 4.4667, which was positive.

Table 4.11 Descriptive Statistics of Productivity Related Factors

Variation	N	Min	Max	Mean	Std. Dv.
An efficient worker would produce more units of work in less time.	180	1.00	5.00	4.5667	.66936
An efficient worker carries out his work with high degree of workmanship.	180	1.00	5.00	4.5333	.74294
More committed worker is productive.	180	1.00	5.00	4.500	.80847
An efficient worker achieve set target.	180	1.00	5.00	4.4667	.86780
Valid N (listwise)	180				

4.1.2 Managerial Related Factors

The results of this part of the study provide an indication of the mean value and ranking of managerial related factors in descending order according to respondent's response. In Table 4.12, in relating to managerial factors, there are 24 variables measuring managerial factors. Surprisingly, the respondents strongly agreed to 21 variables and agreed to the 3 remaining variable. This is an indication that managerial related factors are crucial to site operative's productivity.

The responding rate of the variables on the table 4.12 was very high. The majority of 180 respondents strongly agreed that, a worker that is strongly motivated will certainly put in more effort on the job,at the mean value of 4.8000. They agreed also at the mean value of4.7500 that availability of qualified staff, and training proprietors and technicians would enhance productivity on the site. Respondents again gone further to agree that supervision based on leadership by example will influence productivity at the mean value of4.6667. On safety and health variable, respondents strongly agreed that danger or caution signals and posters gets operatives informed of danger than verbal warning at the mean value of4.4000. The last but not the least factor respondents agreed at mean value of 3.8167 to was training and orientation of new operatives affects productivity, thus to say new recruits of operatives should either have orientation or training on their work. This can be explained as shown by Table 4.12.

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Table 4.12 Descriptive Statistics of Managerial Related Factors that Influence Labour Productivity.

Variation	N	Min	Max	Mean	Std. Dv.
A strongly motivated worker will certainly put in more effort on the job.	180	1.00	5.00	4.8000	.62891
Availability of qualified staff, training proprietors and technicians would enhance productivity.	180	1.00	5.00	4.7500	.62423
Supervision based on leadership by example influence productivity	180	2.00	5.00	4.6667	.59795
Experience supervisors Plan their work ahead of time and this affects productivity.	180	1.00	5.00	4.5667	.69395
Friendly environment enhances site operatives' productivity.	180	1.00	5.00	4.5667	.66936
Task is well executed when divided to small units for effective monitoring and supervision.	180	3.00	5.00	4.5333	.61997
A strongly motivated worker will certainly perform his/her work at a higher quality.	180	1.00	5.00	4.5167	.74350
A strongly motivated worker will certainly work more productively.	180	2.00	5.00	4.5167	.69696
Experience supervisor knows his team (equitably share work and match skills).	180	1.00	5.00	4.5000	.72080
Interpersonal relations (management/operatives relationship) affect productivity.	180	1.00	5.00	4.4833	.76571
Communicating what the Forms of expectations are to operatives enhances productivity.	180	1.00	5.00	4.4833	.74350
Planning of task (`be such that it follow sequential manner to avoid other operatives waiting for uncompleted task, before the next task is executed).	180	3.00	5.00	4.4500	.61884
The level of skill of Labour Force enhances productivity	180	1.00	5.00	4.4500	.74200
Project management style (e.g. engineer gives instruction to foreman not labourer), enhances productivity	180	1.00	5.00	4.4500	.88611

Tasks carried out in gangs enhance new learning skills, an opportunity for individual development of skills	180	1.00	5.00	4.4333	.86586
Danger or caution signals and posters gets operatives informed of danger than verbal warning.	180	1.00	5.00	4.4000	.75930
First aid kit provided would speed up recovery of minor injuries and would add up to productivity of operatives.	180	3.00	5.00	4.3500	.65566
Organization saves money On medicals by providing Protective clothing to operatives.	180	2.00	5.00	4.3500	.77297
Orientation for (fork-lift and dumper Operators) reduces accident rate on site.	180	2.00	5.00	4.3000	.78320
On-the-job training Enhances the performance of operatives.	180	1.00	5.00	4.2833	.91709
Employees who have knowledge, skills and abilities acquired through training increase productivity at the site.	180	2.00	5.00	4.2833	.71124
Quick interpretation of Drawings by experience Supervisor enhances operative's productivity.	180	1.00	5.00	4.2500	.88989
On-the-job training program Demonstrate a true interest of management drive to raise employee productivity.	180	1.00	5.00	4.2000	1.08004
Training and orientation of new operatives affects productivity.	180	1.00	5.00	3.8167	1.12103
Valid N (listwise)	180		5.00		

4.1.3 Technical/Technological Related Factors

Analysis of the sub-factors under the Technical/ Technological related factors are broad category of determinants of operatives on site presented in Table 4.13. There are 12 variables under this heading. The majority (8) of the respondents rated and strongly agreed that 'required tools and equipment adequately provided for work would affect productivity' at a mean value of 4.5333. The response rate was very high indicating that each variable measured well, certain situations on site that hinders operative's productivity. Results of respondents again shown at mean value of 4.5000 that, inappropriate methods retard operatives' productivity is one of the most influential factors that affects labour productivity on site. They again strongly agreed that storage location should be close to avoid double handling by operatives (stockpiles should be close to mixing plant), ranking third and at a mean value of 4. 4333. Results of respondents show that, quick replacement and repairs of broken down and old equipment is one of the most influential factor that affects labour productivity on site, they strongly agreed this at a mean value of 4.3000. This is followed by poor material storage facilities at the mean value of 4.2833, and then followed by conjunction and poor access in project site ranking seventh at the mean value of 4.2667. The responses are set in the descending order to determine the ranking.The last response on the table isproductivity

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would increase if jobs were designed in a way that would make them meaningful and challenging to operatives, at a mean value of 3.6500 (see Table 4.13).

Table 4.13 Descriptive Statistics of Technical/Technological Related Factors that Influence Labour Productivity.

Variable	N	Min.	Max	Mean	Std. Dv.
Required tools and equipment adequately provided for work would affects productivity.	180	1.00	5.00	4.5333	.72002
Inappropriate methods retard operatives' productivity.	180	3.00	5.00	4.5000	.64730
Storage location should be close to avoid double handling by operatives (stockpiles should be close to mixing plant).	180	1.00	5.00	4.4333	.74068
Insufficient transportation facilities for workers retard productivity.	180	1.00	5.00	4.3500	.98296
Quick replacement and repairs of broken down and old equipment positively influence productivity.	180	1.00	5.00	4.3000	1.00779
Poor material storage facilities negatively affect productivity.	180	1.00	5.00	4.2833	1.02087
Conjunction and poor access in project site retards productivity of workforce.	180	1.00	5.00	4.2667	1.12662
Constant disruption of work (Frequent changes in design and specifications) badly influence productivity.	180	1.00	5.00	4.2500	1.15248
Resistance to accept newtechnologies or new way of doing things has negative effects on productivity.	180	1.00	5.00	4.2333	1.11916
When job complexity is increased, operatives feel a sense of meaningfulness and responsibility regarding their jobs.	180	1.00	5.00	4.3333	1.01882
Operative are challenged when assigned to operate small machines.	180	1.00	5.00	4.0167	.99426
Productivity would increase if jobs were designed in a way that					

would make them meaningful and challenging to operatives.	180	1.00	5.00	3.6500	.6500
Valid N (listwise)	180				

4.1.4 Labour Union Related Factors

In Table 4.14, highly motivated operatives are highly committed to organizational goals, was the variable that had the highest response and ranked 1st at the mean value of4.7333. The respondents strongly agreed to 4 variables and agreed to 8 of them, indicating all 12 variables was highly considered by respondents as Labour Union related factors that influence operatives' labour productivity. The last item in terms of ranking was 12 and at mean value of 3.6667, that is permanent workers are committed to their organization than casual workers. (see Table 4.14).

Table 4.14 Descriptive Statistics of Labour Union Related Factors that Influence Labour Productivity.

Variable	N	Min.	Max	Mean	Std. Dv.
Highly motivated operatives are highly committed to organizational goals.	180	2.00	5.00	4.7333	.63069
Attending an employee's relative funeral (Personal family problems) in Ghana affect productivity.	180	1.00	5.00	4.4667	.94189
Workers involvement in decision-making on site positively affects productivity.	180	1.00	5.00	4.3833	.79997
Level of commitment of workers positively affects productivity.	180	1.00	5.00	4.3333	.99720
Workers working in gangs improve productivity.	180	2.00	5.00	4.2500	.72370
Management assisting operatives to solve their personal problem leads to high commitment.	180	1.00	5.00	4.2000	.91175
Job security creates competition among operatives.	180	1.00	5.00	4.1667	.93653
Operatives who are sure of The security of their job Work with high enthusiasm.	180	1.00	5.00	4.0333	.91481
Unionized operatives Accrued much gain including improved attitudes and commitment.	180	1.00	5.00	4.0000	.98593
Trade Union rules have positive influences on productivity.	180	1.00	5.00	3.9667	.98537
Existence of labour or trade union unites labour force to work as a team.	180	1.00	5.00	3.8167	1.19344

Permanent workers are committed to their organization than casual workers.	180	1.00	5.00	3.6667	1.40231
Valid N (listwise)	180				

4.2 Biographical Variables Related Factors

Table 4.15, Reports on Biographical Variables Related Factors. There was high response on biographical factors except on the variable ethnic background of a worker will impact on his/her productivity respondents shown no idea at a mean value of 2.6833. There are15 variables and respondents strongly agreed to 8 with Nutrition and physique of workers leads to higher productivity becoming the highest, and they agreed to 6 of the variables, and then were uncertain/no idea for 1variable.

Table 4.15 Descriptive Statistics of Biographical Variables Related Factors

Variable	N	Min.	Max	Mean	Std. Dv.
Nutrition and physique of Workers leads to higher productivity.	180	2.00	5.00	4.4833	.88737
Food at canteen for workers at subsidized price will reduce time for breaks leading to productivity improvement.	180	1.00	5.00	4.4667	.82827
Better nourished labour force would increase productivity.	180	2.00	5.00	4.4333	.76297
Employers are not willing to employ older individuals, inparticular older women.	180	1.00	5.00	4.3833	.91709
There is low female participation in the labour force.	180	1.00	5.00	4.3333	.85221
Female workers turn to retire from their jobs earlier than their male counterparts.	180	1.00	5.00	4.2833	.97037
Younger workers prefer work based on contract (Finish and go) which enhances productivity of the workforce.	180	1.00	5.00	4.2833	1.11503
Slow adaptability of new technology of older folks affects productivity negatively.	180	1.00	5.00	4.2333	1.16322
Level of familiarity with current job and condition improves productivity.	180	1.00	5.00	4.2167	.84082
Experience of operatives mitigates the decline in productivity in older operatives.	180	1.00	5.00	4.1500	1.11102
Age of the workforce influence productivity.	180	1.00	5.00	4.1333	.88690

Expatriate operatives are expensive to hire by management than the indigenes.	180	1.00	5.00	4.1000	1.10913
Language barrier Could affect progress of work (time used interpreting the language)	180	1.00	5.00	4.1000	1.12414
Operatives with higher Cognitive ability will be in better jobs that have higher ability requirements for good wages.	180	1.00	5.00	4.0167	1.19344
Ethnic background of a worker will impact on his/her productivity.	180	1.00	5.00	2.6833	1.42396
Valid N (listwise)	180				

4.3 External Related Factors

Table 4.16, illustrates the ranking of factors for the external group. Muddy site due to continue rains render access roads inaccessible were ranked first in the external group, with a mean value of 4.5833 and second among all 12 external related factors negatively affect labour productivitywasadverse weather condition was the next with a mean value of 4.4500 and ground conditions necessitating revisions (e.g. water gushing out of the ground), this ranked third at a mean value of 4.4500.Repetition of work and work changes affect productivity ranked fourth on the Table 4.16 with a mean value of 4.4167.The respondents strongly agreed to eight variables and agreed to the four remaining variables.The last but not the least sub factor respondents agreed to at a mean value of 3.6167 was Project Engineer's inspection interruptwork assigned to operatives (see Table 4.16).

Table 4.16Descriptive Statistics of External Related Factors that Influence Labour Productivity

Variable	N	Min.	Max	Mean	Std. Dv.
Muddy site due to continue rains can render access roads inaccessible and would affects productivity negatively	180	1.00	5.00	4.5833	.73898
Adverse weather condition (Harsh weather).	180	1.00	5.00	4.4833	.92438
Ground conditions necessitating revisions (e.g. water gushingout from ground).	180	2.00	5.00	4.4500	.80692
Repetition of work and work changes affect productivity.	180	1.00	5.00	4.4167	.88359
Energy/fuel crises, insufficient energy to power the plants have negative impact on productivity.	180	1.00	5.00	4.3833	.97037
Land litigation has a very high negative influence on productivity.	180	1.00	5.00	4.3833	.87979

Material availability (in quantity & quality) affects productivity.	180	1.00	5.00	4.3833	.97037
Inflation in material prices negatively affects work output.	180	2.00	5.00	4.3333	.87165
Inspection of activities that lead to fire at areas where flammable and combustible substances are stored.	180	1.00	5.00	4.2333	.86586
Late instruction from owner to carry out a task negatively affects productivity.	180	1.00	5.00	4.1167	.89863
Waiting for Project manager's instructions negatively affects productivity.	180	1.00	5.00	3.9333	1.17040
Project Engineer's inspection interrupt work assigned to operatives.	180	1.00	5.00	3.6167	1.32140
Valid N (listwise)	180				

5.0 CONCLUSION

Table 4.10, presents the analysis of the subcomponents of onsite productivity constraints and respondents strongly agreed that Governments influence on the construction process as a constraint to operatives' productivity. In terms of constraints Thissubcomponent constraints, has a variable which is related to a statutory compliance in Building Regulation Act (BRA) 1992.This statutory compliance makes a government's agency (MWHWR) the sole registrar of construction companies in Ghana. It compels the construction firms to be in bed with the government, or it would be difficult to win a bid to government project. When work goes down, workers are slapped off with redundancy.It implies that, contractors pay much to acquire projects and tend to under pay the operatives to make profit. Perhaps, this could be the reason the operatives highly rated governments influence as a constraint to productivity. McShane (1996) hints that the impact of Resource Management Act 1991 (RMA) on on-site labour productivity is profound, especially in relation to resource content issues. The Department of Building and Housing (DBH, 2009) also notes that a number of industry leaders see regulation in its broadest sense as a critical factor constraining the industry productivity through increased compliance costs, limitation on activity, stifling of innovation and reduction of efficiency on worksites.

The results show that out of the significant 6 variables measuring for constraint of productivity, respondent's response was high, as they agreed to all variables as barriers to productivity. The other constraints agreed by respondents which affect the productivity are the level of empowerment of operatives, thus giving training and, resource operatives with the necessary equipment, would influence productivity positively. The next constraint to labour productivity agreed by respondents is material related, acquiring materials from unreliable material source or supply. Respondents again strongly agreed that inspection delays by authorities negatively affect productivity, for that matter a constraint. These were followed by 'restrictive union contract has bad effects on labour productivity of site operatives', as indicated on Table 4.10. The variable EPA (Environmental Protection Agency) approval does delays progress of work and affects labour productivity being the key legislation affecting construction contracts and operations - was rated very low by majority of the respondents. It is surprising to note that the EPA – being the key legislation about health and safety in construction activities and operations - was rated very low by majority of the respondents. Perhaps, this could be due to the increased ignorance of, and proactive response to, the Act since all parties must now abide by its provisions.

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For instance, Wilkinson and Scofield (2010) recognized the choice of procurement system as having a major impact on the achievement of time, cost and quality targets for a project. Mbachu and Nkado (2007) discovered factors involving the acts of omission of the role of key personnel including clients, consultants and contractors, as well as project characteristics and external factors. In New Zealand, Page (2010) identifies level of trade skills, project organisation and design detailing. The BCSPT Report (DBH, 2009) points to sector extensive scarcity of skills, procedure to procurement of construction projects, lack of innovation in the construction practices, and the impact of regulations as causes of low productivity growth of the New Zealand building and construction sector between 1997 and 2008.

A report by Egan (1998), focused on providing shelter or building houses, it points to numerous constraints including processes and overuse of materials, poor management-worker relationships, undetermined targets and ineffective measurements of performance as some of the productivity constraints. As it relates to productivity, the main argument put up by the Egan Report is that devoid of best practices and measurable indicators to help monitor the progress of improvements, the task to produce better projects (including improvement of productivity) will not be feasible owing to faulty processes and lack of benchmarks. The Report also identified design problems, poor supervision and workmanship, and faulty materials as main causes of defects and low productivity. On the other hand, the Report admits that the identified constraints are unlikely to explain fully the sector's poor productivity performance, and therefore calls for further research in this area.

5.1 Determinants of Productivity of Operatives

This subsection introduces the main determinants or 'drivers' oflabourproductivity growth. The main drivers of operatives' productivity are the determinants which have been extracted by the principal component analysis (PCA). Four items are extracted, thus quality leadership, communication, motivation and experience supervisors.

5.1.1 Quality leadership

Surprisingly, predicted four top most factors affecting the operatives' productivity on site, sited in the conceptual frame work and questionnaire coincidentally has been extracted by principal component analysis (PCA) tool used to analysethefactors.The first factor 'quality leadership' according the Table 4.20, accounts for55.648% of the total variance and this stresses the importance of management and supervision in construction industry. This findings support what (Makulsawatudom&Sinuthawanarong, 2004) as they bemoaned that, rework is one of the major factors that affect labour productivity in the construction industry.This goes to also buttress whatIyer and Jha (2005) propane, 'that skills and quality of leadership affects strongly and directly on productivity or performance of construction project'(see Conceptual framework pg. 59).

One of the variables used to measure this factor is'Supervision based on leadership by example'. Leadership by example has power to command followers to succumb and very motivational to compel the recalcitrant operative on site to dothejobthey have not intended doing. Leadership by example is a tool to silence any unruly behaviour and for that matter, any site supervisor who applies it would perform credibly and definitely meetsettargets.This strategy works, instead of yelling and picking argument with atradesman, the supervisor can take a hammer and drive a nail, he can take a trowel and collect mortar, he can also use the spadein levelling the ground or use a club hammer to drive a peg into the ground, report to site early before workers van arrive, etc. These acts of the supervisor will silence and help the tradesman to have a positive attitude on the job site.This finding agrees with what (McTague&Jergeas, 2002) found that cost overruns and labour productivity losses on large oil and gas construction projects were the result of many factors such as the apparent "management" deficiency in managing scope, time, quality, cost, productivity, tools, scaffold, equipment, materials, and lack of leadership, among other things.

According to Shehata et al., (2011), it is important that construction project managers have a fair knowledge of the methods leading to evaluation of productivity or equipment and labour. Faridi and El-sayegh (2006) bemoaned the shortage of skills of man power, poor supervision, site management, unsustainable leadership, shortage of equipment to have contributed to delays of projects in U.A.E.
Similarly, Iyer and Jha (2005) re-echoed the same sentiment of skills acquisition. They said in their study, "If project managers have acquired skills in leadership, then project performance can be monitored,

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controlled and managed with high standard of quality". A careful study of Table 4.4, in the current study indicates that there are qualified project managers in the construction industry. About 55% of them being holders of higher national diploma are good signs for the industry.

5.1.2 Communication

In Table 4.20, the second factor explains 6.273% of the total variance and a cumulative percentage of 61.922%. Ineffective and inadequate communication among the supervisors and tradesmen can affect tradesmen motivation and increase mistakes in construction causing detrimental effects to operative productivity. Enshassi et al., (2007), said 'misunderstanding between labour and superintendents was a major factor impacting productivity in the Gaza strip'. Lack of communication was also a factor affecting operative labour productivity in Alberta, Canada (Hewage and Ruwanpura, 2006). Construction involves a variety of tasks being carried out simultaneously engaging various specialists, consultants, contractors, subcontractors and trades. Poor communication among parties involved can spark off various other productivity problems, ranging from resource shortages to intractable disputes among the project participants. Effective interactions among all parties involved in the project on the site are a key to the successful completion of a construction project. These revelations reaffirm the study of Thomas et al., (2002); Chan and Kumaraswamy (2002), who propane that interpersonal relation is one of bottle neck of productivity.

5.1.3 Motivation

Motivation is the third factor, and it explains 4.588% of the total variance and reflects on the primary and secondary motivational needs of the operatives. Undeniably, previous studies have seen factors relating to pay and incentives as significantly affecting motivation of operatives. Monetary factors were found to be preeminent in influencing labour motivation in Turkey (Kazaz and Ulubeyli,2007; Parkin et al., 2009). In Iran, Zakeri et al., (1997) also found monetary issues influencing operatives' motivation to be able to put up their best at work site. Similarly, same findings were discovered in Indonesia (Kaming et al., 1998b). In addition to satisfying the primary motivators related to pay and incentives, tradesmen also require their higher level motivational needs to be fulfilled.

Lack of recognition of good and efficient workers and disregard of tradesmen suggestions can create negative motivational forces in the tradesmen which get reflected in the productive capacity of the labour force. Poor site facilities/conditions are a profound problem at most of the construction sites in Kumasi and Tamale, if compared to construction sites in Accra (capital city of Ghana), and this can be a de-motivator to the workforce. The project management should realize the importance of maintaining workforce motivation in improving operatives' productivity and take necessary actions to satisfy the primary and secondary motivational needs of the (operatives) workforce.

5.1.4ExperienceSupervisors.

This factor 'Experience supervisors' accounts for 3.781% of the total variance and a cumulative percentage of 70.292% andthesestresses importance of supervision in construction. Supervisor absenteeism during working hours can result in the operatives taking on unproductive activities or idling about. Lack of experience of the supervisor can be a major concernand a problem at the job sites with the supervisor being unable to provide necessary guidance to the operatives, resulting in an increase of errors, faulty works, corrections, reworks and double handling.This result Confirm the findings of (Thomas and Sakarcan 1994) who found that supervision and proper coordination of subcontractors have the most significant impact on on-site labour productivity.

(Abdul Kadir et al. 2005) put emphasize on coordination with subcontractors, which was ranked as one of the influential factors in the study. Furthermore Jergeas (2009) and KPMG (2009) argue that effective project integration management, comprising the activities that integrate, coordinate and bring together the various functions and multiple stakeholders, is the key to achieving onsite productivity and performance.As said before,lack of operative labour supervision was identified as a besetting problem affecting labour productivity studies carried out in the Gaza strip and Kuwait (Enshassi et al., 2007; Jarkas and Bitar, 2012) whereas incompetent supervisors were found to significantly impair productivity in Uganda and Thailand (Makulsawatudom et al., 2004;Alinaitwe et al., 2007). Also, the experience of the

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supervisory team reflects on the capability of the site supervisors, especially, when the work is not planned properly,as one the variables used to measure this factor was 'experience supervisors plan their work ahead of time'.

The result or tail-end of inexperienced supervisory is poor site management. Most often theseinexperiencedsupervisorswould accelerate the schedule by increasing the number of workers, and congestion and interference would be the result. Kaming et al., (1998a) reported that a labour density greater than one man per 30 m^2 results in loss of productivity, which intensifies with the degree of overcrowding and the number of men on site. Interference was an important problem influencing productivity in Indonesia and the United Kingdom (Kaming et al., 1997; Olomolaiye, 1988).

5.2 Mathematical Validity and Reliability of Factor Analysis

In summary of the above sections, a mathematical validity and reliability of factor analysis to see a healthy relationship or correlation among the factors extracted by principal component analysis. According to Doloi et al. (2012), if the attributes explain the factor identified by factor analysis, they should exhibit significant correlations with one another. Validity of factor analysis was hence established by calculating the Pearson correlation among the factors tabulated in Table 5.1, supported with statistical evidence. The correlation coefficients show that the attributes were correlated, with all correlations being significant at the 1% significant level. Thusit may be concluded that the factors contain attributes that are related.

The reliability of the factor analysis was established by calculating the Cronbach's alpha reliability coefficient (α) Chan et al., 2012; Doloi et al., 2012; Choi et al., 2011).The Cronbach's alpha coefficient was calculated for the attributes in each grouped factor, as well as on all the attributes and the respective values are shown in Table 5.2a and b. The lower threshold limit of Cronbach's alpha coefficient is 0.7 which reduced to 0.6 in exploratory research (Hair et al., 2011). The value of α for all attributes was 0.897 which is excellent (Doloi et al., 2012). The α values calculated therefore indicate good reliability of the attributes under factor analysis.

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