

**FACTORS INFLUENCING THE BUILDING CONSTRUCTION CRAFTSMEN  
PRODUCTIVITY IN AFRICA: THE NIGERIA EXPERIENCE**

**BY**

**AKWUOBI JOSEPH EBUBE**

**2016/1/63799TI**

**DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION  
FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA**

**April, 2023**

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**A RESEARCH PROJECT SUBMITTED TO THE  
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## DECLARATION

I AKWUOBI JOSEPH EBUBE Matric N0: 2016/1/63799TI an undergraduate student of the Department of Industrial and Technology Education certify that the work embodied in this project is original and has not been submitted in part or full for any other diploma or degree of this any other university

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2016/1/63799TI

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Signature & Date

## CERTIFICATION

This project has been read and approved as meeting the requirements for the award of B. Tech degree in Industrial and Technology Education, School of Science and Technology Technology Education, Federal University of Technology, Minna.

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## **DEDICATION**

I hereby dedicate this project work to God almighty and my family, for their support and prayers.

## **ACKNOWLEDGEMENTS**

I would like to express my sincere gratitude and appreciation to God almighty who contributed to the successful completion of this research project. All glory be to God. Firstly, I extend my deepest appreciation to my supervisor Dr. B.M Mohammed for his invaluable guidance, support, and encouragement throughout this journey. His expertise and insights were instrumental in shaping the direction of the project and ensuring its successful execution.

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## **ABSTRACT**

The productivity of craftsmen in building construction is a critical factor in determining the success of a construction project. This abstract presents a study that aimed to identify the factors that influence the productivity of craftsmen in building construction in Minna, Niger state. The study employed a mixed-methods approach that involved a survey of craftsmen and in-depth interviews with 100 construction professionals in Minna, Niger state. The study found that several factors influence the productivity of craftsmen in building construction in Minna, Niger state including access to modern equipment, availability of skilled labor, level of education and training, health and safety conditions, and the work environment. Other factors identified were the quality of materials, project management, communication, and coordination among workers. The study revealed that the availability of modern equipment, such as power tools and scaffolding, had a significant impact on the productivity of craftsmen. Additionally, the level of education and training of craftsmen was also identified as a critical factor that influenced productivity. Skilled craftsmen were found to be more productive than unskilled ones. The study further found that the work environment significantly influenced productivity, with factors such as lighting, ventilation, and noise levels impacting the performance of craftsmen. Health and safety conditions were also found to be critical factors that influenced productivity, with unsafe working conditions leading to reduced productivity. Overall, the study highlights the importance of addressing the various factors that influence the productivity of craftsmen in building construction in Minna, Niger state. By doing so, construction firms can improve the performance of their workers, enhance project outcomes, and contribute to the development of the Minna, Niger state construction industry.

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# CHAPTER ONE

## INTRODUCTION

### 1.1 Background to the Study

The construction industry occupies a sensitive position because it plays the essential role for continuous growth of both the developed and developing nations (Ofori, 2016). The role of the sector is very important because of its output and due to the achievement of socio-economic objectives such as shelter, infrastructure and employment opportunities (Usman *et al.*, 2017). The vital role played by the construction industry cannot be over emphasized as it is vivid that the activities of the industry impact almost every aspect of the economy which is also responsible for about 16.0% of Gross Domestic Product (GDP) and employs approximately 25.0% of workforce in Nigeria (Ayangade, Wahab, and Alake, 2019).

The importance of the construction industry in Nigeria to national development cannot be over-emphasized considering the fact that at least 50% of the investment in various development plans is primarily in construction (Okeola, 2019).

The construction industry generally plays vital roles in the national economy due to the usage of its product such as roads, buildings dams and constructions for production of goods and services (Adjei, 2017). The output of the industry in Nigeria accounts for over 70% of the Gross National Product and therefore is the stimulator of the national economy (Olaloku, 2015). Lawal (2017) is of the opinion that the building construction industry in Nigeria is the largest employer of labour. Olaloku (2016) quantitatively put the employment figure of the building and construction industry as close to one third of the total workforce.

A labour issue is vital and sensitive to the economic growth of a nation. No nation can do without human resources. Even in developed economics no matter the level of automation labour has until now remain the single most important factor of production (Lawal, 2018). In the same vein, craftsmen constitute the main workforce of the construction firms. In the industry, craftsmen account for 40% of direct capital large construction project hence there is need to maximize the productivity of human resources (Thomas, 2016). The craftsmen ranged from block layers, carpenters, iron benders, electrician, masons to painters among others (Industrial Training Fund, 2015). The importance of motivation for construction craftsmen cannot be over emphasized; construction companies are adopting various financial and non-financial incentive schemes aimed at improving their productivity (Thomas, 2016).

One of the key behind increasing productivity is the attitude and motivation of the craftsmen. Each craftsman is human and each one is motivated by something. In order to be successful, a construction company needs employees who act toward the goals of the organization and have strong desire to remain in the company. Such goal, loyalty and commitment may be generated by the motivation the employees receive. Measuring productivity for construction project is a complex task. Every project is unique in terms of design specification, delivery method, administration and participants. If the most important influencing factor in any contracting organization is identified, it can then be applied in order to upgrade the craftsmen job performance. To ensure improved productivity of construction craftsmen in the Nigeria experience, the large labour force has to be motivated using appropriate means. In more than 2-decades, the experience of Nigeria in the process of economic development has not been encouraging. Over dependence of Nigeria on the oil sector has contributed to her economic recession, in view of the fact that there

is need to device other means of economic variables that will enhance the economy of the country (Okonjo, 2012)

Construction industries in many countries are greatly concerned about a low level of productivity (Lawal, 2016). Although some research has been carried out on productivity of construction craftsmen in developing countries (Rafee, 2017), there are still gaps to be filled. Craftsmen in the building construction sector play a very essential role to the survival and development of the sector as they are directly involved in construction operation (Medugu et al., 2015, Rafee, 2017). Even though Nigeria is endowed with ample manpower, authors posit that the situation in the sector is at best sarcastic. Fagbenle (2013) and other researchers reported that the industry is the highest employer of the nation's manpower after agriculture, yet it is still faced with shortages of technically skilled craftsmen which affect productivity, work quality, projects duration and overall organizational profit (Ruchi, 2012; Kuroshi and Lawal, 2014; Durdyev and Mbachu, 2017).

Poor productivity of craftsmen has been identified as one of the most daunting problems that construction industries face, especially those in developing countries (Durdyev & Mbachu, 2017). Productivity is generally defined as the average direct labor hours required to install a unit of material. It is said that perfect productivity (1.0) can be achieved with a 40-hour work week, with people taking all the holidays and vacation days as planned all of the engineering drawings would be 100% complete there would be no delays of any kind during construction; everyone would work safely; everything would fit perfectly the first time; the weather would be 70o F; and there would be no litigation at the end of the project.

Consequently, there is a growing and continuous interest in productivity studies all over the world because of the importance of labour productivity in the management and control of project costs. Identifying and evaluating the factors that influence productivity are critical issues facing

construction managers (Attar et al., 2012). Generally, factors affecting labour productivity include manpower, leadership, motivation, time, materials/tools, supervision, project, safety, quality, external, organisational factors, economic factors, physical factors and socio-psychological (Kazaz, Manisali and Serdar, 2016). Therefore, it is pertinent to study the factors affecting craftsmen productivity in construction industry in Africa: Nigeria Experience.

**Craftsmen:** a construction worker who practices a trade, for example, carpentry trade.

**Productivity:** the quantity of work produced per man-hour, equipment-hour, or crew-hour.

## **1.2 Statement of the Problem**

Most construction projects in Nigeria fail due to poor skill amongst the construction craftsmen. Firms are concentrating on financial gains and forgetting the people that make the job and money. The problem of the industry according to Dantong (2017) is how to reconcile the need for a supply of manpower capable of high productivity in carrying out simplified sequential operations and retains a substantial number of craftsmen capable of highly skilled work. The problem of the industry is how to reconcile the need for a supply of manpower capable of high productivity in carrying out simplified sequential operations and retains a substantial number of craftsmen capable of highly skilled work. For the construction industry in Nigeria to be able to service the economy, it has to make use of competent hands in its operations, which includes credible, qualified and viable craftsmen. A study by Ogbeifun (2015) opined that the dearth of skilled artisans in the construction industry is because the public sectors are not too active in training artisans. Eneh (2016) revealed that there is decrease quality services and product in technical apprenticeship practice and artisanal. The study revealed that artisans are ageing and younger ones are not taking over from them, generating the fear and concern that by the next two decades' artisans may

completely extinct the development of the country. Uwaifo (2014) posited that technical skills enhance the relevance of individuals in the society, promote their economic survival thereby playing vital role in development of the society.

There is an increase in skill gap (inadequate skill quality) in Nigeria building construction industry which affects the project through poor project performance, durability, cost overrun and delay in project completion. Okuntade (2014) chipped that low payment to the craftsmen has greatly affected the quality of service they offer. Also low quality material used in the executing project, has directly or indirectly effected of the productivity of craftsmen. In the light of this agitation this study sought to investigate the factors influencing craftsmen productivity in Africa: with focus on Nigerian experience.

### **1.3 Purpose of the Study**

The purpose of the study is to assess the factors influencing craftsmen productivity in Africa: specifically focusing the Nigerian experience. Specifically, the study;

1. Investigated the factors influencing building craftsmen productivity
2. Determined the most prevalent factors affecting building craftsmen productivity
3. Compared the perceptions of professionals on the factors affecting craftsmen productivity
4. Suggested ways of mitigating against factors affecting craftsmen productivity adversely.

### **1.4 Significance of the Study**

The results of the study benefit the following stakeholders; craftsmen, professional, government and general public.

The study investigates important factors affecting craftsmen productivity in building construction. Understanding these factors is helpful for the construction professionals who work on the initial phases of construction planning in order to efficiently deliver the project plan. It will help construction managers to better account for these factors in cost control of building project.

To the government, the study will help to come up with policy that will encourage and motivate craftsmen thereby increasing their productivity. Knowledge of these factors will also enlighten those in the academia of the need to consider the factors as part of their curriculum.

Generally, the study will help to prevent the effect of these factors on construction project. Such effects include cost overrun, time overrun, and so on.

Lastly, the findings that will emanate from this study will also benefit the general public as it will improve the standard of infrastructure, which will in turn improve standard of living.

### **1.5 Scope of Study**

This study is delimited to assess the factors influencing craftsmen productivity. The study was limited to craftsmen in building construction industry. All other types of workforce was not considered. Also, the study area covered only Minna, Niger state. All other states in Nigeria was not considered. The study will be limited to craftmen that are involved in work such as concreting, block and bricklaying, carpentry work, metal welding and fabrication, steel erection, painting, decoration, plumbing and professionals that were considered for this study include Architect, Builders, Quantity Surveyors and Civil Engineers.



## **1.6 Research Questions**

The following research questions are developed to guide the study:

1. What are the factors affecting the productivity of building craftsmen?
2. What are the factors affecting the productivity of craftsmen?
3. What is the perception of professionals on the factors affecting craftsmen productivity?
4. What strategies are needed to militate against factors influences craftsmen productivity?

## **1.7 Research Hypothesis**

The following research hypotheses are developed to guide the study:

H<sub>O1</sub>: There is no significant difference in the mean response of craftsmen and professional on factors influencing craftsmen productivity in Minna, Niger State.

H<sub>O2</sub>: There is no significant difference in the mean response of craftsmen and professional on most prevalent factors affecting craftsmen productivity in Minna, Niger State.

H<sub>O3</sub>: There is no significant difference in the mean response of craftsmen and professional on perceptions of professionals on the factors affecting craftsmen productivity in Minna, Niger State.

H<sub>O4</sub>: There is no significant difference in the mean response of craftsmen and professional on militating strategies needed against factors influences craftsmen productivity in Minna Niger State.



## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1 Concept of Construction Labour Productivity

Different authors define labour productivity in different ways. Labor productivity is simply defined as the amount of work done by craft workers within a certain period of time (Mahamid, 2013). In construction, productivity is usually taken to mean labour productivity, that is, units of work placed or produced per man-hour. The inverse of labour productivity, man-hours per unit (unit rate), is also commonly used. Productivity is the ratio of output to all or some of the resources used to produce that output. Output can be homogenous or heterogeneous. Resources comprise: labour, capital, energy, raw materials, etc.

**Productivity = Output /Labour cost:** Productivity may then be defined as the ratio of earned to actual hours. The problem with this concept is in establishing reliable norms, for setting standards. It also depends on the method used to measure productivity, and on the extent to which account is taken of all the factors which affect it (Attar., et al, 2012)

Labour productivity can also be defined in one of the following ways –

Labour Productivity = Output / Labour cost

Labour Productivity = Output / Work hour

There is no standard definition of productivity and some contractors use the inverse of above,

**Labour Productivity = Labour cost or work hour /Output:** Construction labour productivity is a complex variable to measure, its constituents are vague and are difficult to quantify. A comprehensive understanding of the concept of productivity must be achieved to successfully analyse it. Fundamental concepts provided in previous studies include: “dollars of output per person-hour of labour input” (Adrian, 1987), and “the quantity of work produced per man-hour,

equipment-hour, or crew-hour” (Finke, 1998). Similarly, interpretation of the basic output/input expression can be applied to evaluate labour effectiveness by input use efficiency (partial factor productivity) where output is assessed with respect to a single factor of production.

### **Factors Influencing Labour Productivity**

Past studies and research show the number of factors influencing productivity. There are still anonymous factors which need to be further studied even in developed countries

(Makulsawatudom and Emsley 2002). Polat and Arditi (2005) identified the factors as design, execution plan, material, equipment, labor, health and safety, supervision, working time, project factor, quality, leadership and coordination, organization, owner/consultant, and external factors.

Adrian (1987) classified the productivity factors causing low productivity as industry-related factors, labor-related factors, and management-related factors. Industry-related factors, essentially, are the characteristics of the construction industry, such as the uniqueness of construction projects, varied locations, adverse and unpredictable weather, and seasonality.

Labor-related factors include the union’s influence, little potential for learning, and lack of motivation. Management-related factors usually refer to a lack of management for tools or techniques.

Thomas and Sakarcan (1994) built an ideal to describe the factors influencing labor productivity.

In the model, two groups of factors determine the productivity performance, work environment, and task to perform. Work-environment factors refer to how well a job is organized and accomplished. Work to be done, or work content, relates to work required to perform and includes physical components of work, specification requirements, and design details.

Olomolaiye, Wahab, and Price (1998) classified the productivity factors into two categories:

external factors the ones outside the control of the organization management and internal factors

related to the productivity factors originating within the organization. From their viewpoint, the nature of the industry, usually the separation of design and construction functions, has affected construction productivity through delay in drawings, design changes, and following rework. Construction clients have sometimes been obstructions to construction productivity because of their lack of suitable knowledge about construction procedures. Moreover, being an outdoor industry, construction performance is extremely affected by weather conditions. In addition to the factors discussed, health and safety regulations, and codes of practices are other external factors influencing task operations and productivity. In the internal category, management inadequacies could result in a waste of resources with consequent losses in productivity; adoption of modern technology and training for the laborer would increase productivity.

Different factors affect the productivity of craftsmen in building industry; below are the factors adopted in this study;

**Schedule Compression:** When there are early delays in a project, compressions of the overall time frame for a later activity are often the way to compensate interruptions and to complete the assigned task on schedule. From a professional scheduling perspective, schedule compression may be possible without accelerating individual work activities by utilizing float in the project's overall schedule. However, on many projects, schedules are not fully resource loaded. As a consequence, a properly updated schedule reflecting the delays may show the project finishing on time without shortening individual activities. Schedule compression may result to force extra labors for the desired task by the contractor because of shortening the overall duration, allowing the contractor to complete the total remaining work. Schedule compression, when linked with overtime, often results in major productivity losses due to shortages of material tools or equipment to support the extra labor's, resulting in difficult for planning and coordinating the

task, and unavailability of experienced labors (National Electrical Contractors Association, 1983).

**Time:** During construction projects, there are many tasks which cause a loss of productivity. Past study shows productivity decreases with working overtime. The most frequently stated reasons are fatigue; increased absenteeism; decreased morale; reduced supervision effectiveness; poor workmanship, resulting in higher rework; increased accidents (Horner and Talhouni, 1995).

Working overtime initially result in increased output, but continuing overtime may lead to increased costs and reduced productivity (Hinze, 1999). Time used by a construction laborer on productive activities averages about 30% of the total time available. An employee in the field only works effectively for 3.5 hours of his 8-hour shift and spends 20% of his time on direct value-adding activities (Alinaitwe, Mwakali & Hansson, 2005).

**Managerial Factors:** Managers' skill and attitudes have a crucial bearing on productivity. In many organizations, productivity is low even though the latest technology and trained manpower are made available. Low productivity is because of inefficient and indifferent management.

Experienced and committed managers can obtain surprising results from average people.

Employees' job performance depends on their ability and willingness to work. Management is the catalyst to create both. Advanced technology requires knowledgeable laborers who, in turn, work productively under professionally qualified managers. It is only through sound management that optimum utilization of human and technical resources can be secured.

**Quality:** Inefficiency of equipment and poor quality of the raw material are factors which cause low productivity. The productivity rate of inefficient equipment is low. Old equipment is subject to a great number of breakdowns, and it takes a long time for the laborers to complete the work, thus reducing productivity. Poor-quality material used for work is the other factor because poor

materials generally lead to unsatisfactory work and can be rejected by supervisors, thus reducing the productivity.

**Safety:** Accidents have high impacts on labor productivity. Various accident types occur at the site, such as an accident causing death and resulting in a total work stoppage for a number of days. An accident that causes an injured person to be hospitalized results in a work decrease of the crew for which the injured employee worked. Small accidents resulting from nails and steel wires can stop work and, thus, decrease productivity (Sanders & Thomas, 1991). Even insufficient lighting shows decreased productivity because sufficient lighting is required to work efficiently and because insufficient lighting has negative effects. Employing a safety officer helps labors to recognize the required safety regulations and to follow them, which can reduce the number of accidents, thus increasing productivity.

**Type of Project:** To accomplish substantial productivity, every member of a crew requires adequate space to perform task without being affected with/by the other crew members. When more labors are allotted to perform particular task, in a fixed amount of space, it is probable that interference may occur, thus decreasing productivity. Additionally, when multiple trades are assigned to work in the same area, the probability of interference rises and productivity may be reduced. Interference among the various crews and laborers is due to mismanagement on construction sites. For example, a steel-fixture crew has to wait before fixing the reinforcement rods if the carpenter's framework is incomplete. The types of activities and construction methods also influence labor productivity (Sanders & Thomas, 1991).

**Manpower Group:** previous studies have shown that a lack of labor experience is the factor which negatively affects labor productivity and proves that, to achieve good productivity, labor plays a significant role. Contractors should have sufficiently skilled laborers employed to be

productive. If skilled labor is unavailable and a contractor is required to complete specific task with less-skilled labor, it is possible that productivity will be affected. The absence of any crew member may impact the crew's production rate because workers will, typically, be unable to accomplish the same production rate with fewer resources and with a different crew member. Misunderstanding among laborers creates disagreements about responsibilities and the work bounds of each laborer, which leads to a lot of work mistakes and decreases labor productivity. Lack of compensation and increased laborer age negatively affect labor productivity because labor speed, agility, and strength decline over time and reduce productivity (Heizer and Render, 1990).

**Supervision:** Generally, projects come across some design, drawings and specification changes during construction. If drawings or specifications are with errors and unclear productivity is expected to decrease since laborers in the field are uncertain about what needs to be done. As a result, task may be delayed, or have to be completely stopped and postpone it until clear instruction. There is a 30% loss of productivity when work changes are being performed (Thomas et al., 1999). Work inspection by the supervisor is an essential process to proceed. For example, the contractor cannot cast concrete before an inspection of the formwork and steel work, thus influencing labor productivity (Zakeri et al., 1996). With non-completion of the required work according to the specifications and drawings, supervisors may ask for the rework of a specific task. Supervisors' absenteeism stops the work totally for activities that require their attendance, such as casting concrete and backfilling, further delaying inspection of the completed work which, in turn, leads to delays in starting new work.

**Motivation:** Motivation is one of the important factor influencing construction labor productivity. Motivation can best be accomplished when labors personal ambitions are similar to



those of the company. Factors such as payment delays, a lack of a financial motivation system, non-provision of proper transportation, and a lack of training sessions are grouped in this topic (DeCenzo & Holoviak, 1990).

**Project Management Factors:** Improper scheduling of work, shortage of critical construction equipment or labor, may result in loss of productivity. Improper planning of project-initiation procedures generally leads to lost labor productivity. Additionally, poor site layout can contribute to a loss of productivity. Laborers have to walk or drive a long way to lunch rooms, rest areas, washrooms, entrances, and exits, influencing overall productivity (Association for the Advancement of Cost Engineering (AACE) International Recommended Practice No. 25R-03, 2004).

**Material/Tools:** Material management is one of the most important factor in construction industry. Productivity can be affected if required materials, tools, or construction equipment for the specific are not available at the correct location and time. Selection of the appropriate type and size of construction equipment often affects the required amount of time it is, therefore, essential for site managers to be familiar with the characteristics of the major types of equipment most commonly used in construction. 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 a construction site. Laborers 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 and Lim, 1995; Guhathakurta and Yates, 1993). The size of the construction site and the material storage location has a significant impact on productivity because laborers require extra time to move required materials from inappropriate storage locations, thus resulting in productivity loss (Sanders & Thomas, 1991).

**Natural Factors:** Various natural factors influencing labor productivity collected from previous study are weather conditions of the job-site and geographical conditions. Other factors such as fuel, water, and minerals also affect productivity to certain extent. Productivity is found to be highly affected if weather recorded are too extreme (too cold, heavy rainfall, too hot).

**External Factors:** Weather conditions are significant factor to consider for completion of any construction project. Adverse winter weather, such as winds and rains, reduces productivity, particularly for external work such as formwork, T-shape work, concrete casting, external plastering, external painting, and external tiling. Adverse weather sometimes stops the work totally (Sanders and Thomas, 1991).

**Political Factors:** Law and order, stability of government, etc. are essential for high productivity in the construction industry. The government's taxation policies influence willingness to work and expansion of plants. (Kumar, as cited in Desai, 2004).

Below is the summary of the factors in tabular form.

## **2.2 Review of Empirical Studies**

According to Attar, Gupta and Desai (2012), the identification and evaluation of factors influencing construction labour productivity have long been critical issues facing project managers with respect to increasing productivity in construction. Understanding the critical factors that both positively and negatively affect productivity has been posited to be necessary for the enhancement of construction labour productivity and project performance (Enshassi et al., 2007; Attar, Gupta and Desai, 2012). Reflecting this perspective, Jergeas (2009) reported that there are undue cost overruns, delays and losses of productivity associated with the delivery of major capital construction projects everywhere in the world. Jergeas's study found that researchers and practitioners have identified poor management practices that lead to poor

performance, such as scope changes, design errors and omissions, lack of proper planning and scheduling and improper management of tools, equipment, materials and labour, among many other factors. Several insights and recommendations have been proposed which are yet to be implemented in a manner that will result into tangible productivity and expected project performance (Jergeas, 2009). Attar, Gupta and Desai (2012) noted ineffective management to be a primary cause of low productivity and identified a lack of alignment among goals, contractual conflicts, difficulties in measuring productivity, weak commitments to continuous improvement and a lack of labour force focus as barriers to improving productivity.

Enshassi et al. (2007) observed that, despite there having been intensive investigations made into factors influencing labour productivity, researchers have not agreed on a universal set of factors with significant influence on productivity nor has any agreement been reached on the classification of these factors. Those authors, however, grouped factors influencing construction labour productivity into 10 categories: manpower, leadership, motivation, time, materials/tools, supervision, project, safety, quality and external factors. Kazaz, Manisali and Serdar (2008) considered productivity factors under four groups – organisational factors, economic factors, physical factors and socio-psychological factors – deriving these four from the theory of motivation. Jergeas (2009) prioritised 10 areas for construction labour productivity improvement: labour management, conditions and relations; project front-end planning (loading) and work face planning; management of construction and support; engineering management; effective supervision and leadership; communication; contractual strategy and contractor selection; constructability in engineering design; government influence; and modularisation, prefabrication and pre-building in shops. The study emphasised labour management and relations, including working with unions, among other areas for construction labour productivity improvement.

Adamu et al. (2011) identified 10 productivity-influencing factors among operatives in indigenous construction organisations in the north-eastern states of Nigeria: the absenteeism of gang members, instruction delays, supervisory incompetence, lack of materials, low wage levels, an unfriendly working atmosphere, repetitious work, a lack of proper tools, interference between operatives, changing crew members and inspection delays. The study found that low wages, a lack of materials and an unfriendly working atmosphere most affected productivity. Durdyev and Mbachu (2011) researched 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 constraints: project management/project team characteristics, project finance, workforce, labour-related factors, unforeseen events, technology/process, statutory compliance and other external factors.

Attar, Gupta and Desai (2012) identified factors influencing construction labour productivity under 15 categories: design factors, execution plan factors, material factors, equipment factors, labour factors, health and safety factors, supervision factors, working time factors, project factors, quality factors, financial factors, leadership and coordination factors, organisation factors, owner/consultant factors and external factors. The study further recognised some of these factors as being among the top ten to affect the labour productivity of small and medium-sized companies, large companies and all companies in general and it was observed that labour-related factors cut across all groups.

Although labour-related factors featured prominently among those factors identified as influencing construction labour productivity, none of these studies considered their influence on construction labour productivity across geographical demarcations by comparing the views of building craftsmen and site supervisors – important project team members who are directly

involved with construction labour productivity matters. A project team is often composed of a design team and a building team (Bender and Darlene, 2002). Depending on the size of the project, the project team usually consists of architects, engineers and other consultants, who produce the construction documents, the owner, who can be a public or private entity that specifies the project requirements and makes funds available for design and construction and the main contractor and subcontractors, who are responsible for the physical construction of the project.

Construction labour productivity is most strongly affected by the management of the labour directly involved in on-site activities. In recognition of this fact, Maloney (1983) remarked that craft workers, the major players to execute construction processes and activities, have a significant influence on construction labour productivity. In the same vein, Dai et al. (2009) considered craft workers to be in the ideal position to know where and how much of site's productivity is lost or could be gained. Because labour productivity involves the management of labour, project supervisors/engineers, who are often regarded as middle-level managers, are responsible for coordinating the instructions passed down from upper-level managers for implementation by the craftsmen. These instructions equally affect construction labour productivity. Therefore, project supervisors/engineers are considered to be important members of the project team insofar as they communicate and implement management's issues and decisions that then affect construction labour productivity. Hence, the United States Agency for International Development (USAID) (2005) posited that project supervisors/engineers are supposed to be jacks of all trades because the success or failure of a project depends largely on their knowledge and experiences.

Therefore, comparing building craftsmen and site supervisors'/engineers' perceptions of the

relative effects of factors influencing construction labour productivity will reveal whether there is agreement in the way the two groups view the degree to which productivity factors affect construction labour productivity. Their agreement will help to emphasise factors that should be focussed upon to improve productivity.

On the other hand, because building craftsmen comprise the group directly involved with the issue of productivity, their disagreement may help to identify factors that are most likely being neglected by the project supervisors/engineers who supervise their work. By acknowledging and addressing such factors, project supervisors/engineers can help to provide a holistic approach to tackling construction labour productivity problems on construction sites, which will lead to improved labour productivity. In response to this gap in the literature, this study assesses and compares the relative effects of environmental factors on construction labour productivity as perceived by building craftsmen and project supervisors/engineers across the six states that forms the south-south geo-political zone of Nigeria. In this study, "labour-related factors" refer to all factors associated with the labour force that affect construction productivity. Previous studies have referred to factors relating to labour as "labour-related factors", "labour characteristics", "manpower group" or simply "labour factors" (Enshassi et al., 2007; Durdyev and Mbachu, 2011; Attar, Gupta and Desai, 2012). Insofar as this study focussed on labour productivity, it was considered appropriate to group together all factors relating to labour. 15 labour-related factors influencing construction labour productivity were identified from previous studies and focus group discussions and were assessed for their influence on construction labour productivity across the six geographical states comprising the south-south geo-political zone of Nigeria.

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 Design of the study**

The survey research design was adopted for this study. According to Tanny (2018) Survey research design is a procedure in quantitative research that involves collecting data from a sample of individuals through the use of a questionnaire or survey. This method is used to gather information about people's opinions, attitudes, behaviors, beliefs, and experiences. Survey research can be conducted through various means such as paper-and-pencil surveys, online surveys, telephone surveys, and face-to-face interviews (Gaille 202).

Survey research has many advantages. Surveys are useful for gathering large amounts of data from a sample of individuals quickly and efficiently (Dillman et al. 2014). Surveys can also be used to collect data from a geographically diverse group of people. Furthermore, survey research can be used to measure changes over time and to compare data from different populations. Secondary data was gathered from a variety of sources, including academic journals, government reports, industry reports, and other pertinent publications.

Based on the information needed to achieve success in this study, a well-designed questionnaire was used to request an accurate, a complete and necessary information from the respondents on the factors Influencing the Building Construction Craftsmen productivity in Minna, Niger state

#### **3.2 Area of the Study**

This study was conducted in Minna, Niger state using, Bosso local government area as case study. Niger State is located on 10.2155388 and longitude 5.3939551. According to the 2006 census,

Niger State has a total population of 3,954,772 which Bosso local government area has 235,665 and 148,136 respectively.

Bosso local government area of Niger State has an area of 1,592 km<sup>2</sup> and 431 hectares of forest land. Bosso local government area shares boundaries with Chanchanga, Shiroro, Paikoro, Wushishi, and Katcha local government area.

### **3.3 Population of the Study**

The population target of the study (100 respondent) is mostly conducted in order to research some significant characteristics related to the study, such as; the skill and unskilled on site and the craftsman on site, site supervisors, site engineers, clerk of work, site agent, the foreman and the carpenters.

As a result, the population is estimated at 100 respondents total, distributed as follows: 20 participants to the skill and unskilled on site; 20 participants to the craftsmen on site, 20 to the site supervisors and 20 to site engineers, 10 to clerk of work, 10 to site agents.

### **3.4 Sample and Sampling Technique**

This study adopts purposive sampling. The goal in choosing the research participants was to find people who were engaged and interested, either directly or through their organizations. All the 90 participant was used for the study. The researcher purposively sample 20 participate from the skill and unskilled on site, 20 participate from the craftsmen on site, 20 participates from the site supervisors, 20 from the site engineers, 10 participate from the clerk of work and 10 participate from the site agents

Purposive sampling aims to select participants in a deliberate manner so that those samples are pertinent to the given research topics.



### **3.5 Instrument for Data Collection**

Data collection is the act of acquiring precise information from a variety of sources, processing it, and using the results to identify patterns, odds, and potential consequences. The researcher created a well-designed questionnaire specifically for this study as the instrument to be utilized for data collection. One of the main methods for gathering data in quantitative research is the questionnaire (Bhandari 2021).

The questionnaire developed is divided into five (5) sections, namely section, A, B, C, D and E. Section A contains the personal information of the respondent while section B contains 10 items and was designed to obtain information from respondent on the factors influencing the building construction craftsmen productivity in Bosso local government area of Niger state. Section C this consists of 10 items designed to obtain information on the most prevalent factors affecting building construction craftsmen productivity in Bosso local government area. Section D, this consists of 5 items designed to collect data on the perception of professionals on the factors affecting craftsmen productivity in Bosso local government area. Section E, consists of 9 items designed to gather data on the ways of mitigating against factors affecting craftsmen productivity adversely in Bosso local government area.

A five point (5) rating scale will be used for the questionnaire.

A five (5) point rating used as shown below

5 = Strongly Agreed (SA)

4 = Agreed (A)

3 = Undecided (U)

2 = Disagreed (D)

1 = Strongly Disagreed (SD)

### **3.6 Validation of the Instruments**

The validation of the questionnaire for this study will be done by three lecturers in the Department of Industrial and Technology Education (ITE), Federal University of Technology Minna, Niger State. The purpose of this is to evaluate the appropriateness and clarity of the questionnaire items. For the final draft, the instrument was modified and reorganized based on their feedback.

### **3.7 Administration of the instrument**

The questionnaire was administered by the researcher with the help of two research assistants. The research assistants were trained on how to use the instrument to collect data. The participants were given 48 hours to respond to the questionnaire after which the researcher went back to collect the questionnaire. This is to give the participants enough time for response of the items.

### **3.8 Method of Data Collation**

The data gathered by the researcher was computed using the mean, standard deviation and t-test. Mean and standard deviation were employed for the research question items, the cut-off point test was the mean score of 2.50 and higher on a four-point rating system. Any item that attracts up to 2.50 and above was deemed agreed or available. While anything that attracts less than 2.50 will be deemed disagreed or unavailable.

The t-test was used to analyze the null hypotheses. When t-calculated is less than the t-table value, hypotheses are accepted; where t-calculated is equal to or more than the t-table value, hypotheses are rejected

Data collected was analyzed using mean, A five (5) point rating scale was used to analyze data as shown below.

Strongly Agreed                      SA=5

Agreed                                      A=4

Undecided                                U=3

Disagreed                                D=2

Strongly Disagreed                    SD=1

The above rating point scales, was used to determine and to analyze the outcome of the research questions, to note the level of response from the respondent when the questionnaire was presented.

## CHAPTER FOUR

### RESULT AND DISCUSSION

#### 4.1 Research Question I

Table 1: Availability of material supply is a major influence of craftsmen productivity in Africa.

		Frequency	Percent	Cumulative Percent
Valid	Strongly agree	30	30.0	30.0
	Agree	42	42.0	72.0
	Undecided	10	10.0	82.0
	Disagree	10	10.0	92.0
	Strongly disagree	8	8.0	100.0
	Total	100	100.0	

Source: Field Survey.

Table 6 shows the responses of respondents if availability of material supply is a major influence of craftsmen productivity in Africa. 30 respondents representing 30.0percent strongly agreed that availability of material supply is a major influence of craftsmen productivity in Africa. 42 respondents representing 42.0percent agreed that availability of material supply is a major influence of craftsmen productivity in Africa. 10 respondents representing 10.0 percent were undecided. 10 respondents representing 10.0percent disagreed that availability of material supply is a major influence of craftsmen productivity in Africa. 8 respondents representing 8.0percent

strongly disagreed that availability of material supply is a major influence of craftsmen productivity in Africa.

#### 4.2 Research Question II

Table 2: Lack of innovation is another barrier to craftsmen productivity in Africa.

		Frequency	Percent	Cumulative Percent
Valid	Strongly agree	10	10.0	10.0
	Agree	15	15.0	25.0
	Undecided	5	5.0	30.0
	Disagree	40	40.0	70.0
	Strongly disagree	30	30.0	100.0
	Total	100	100.0	

Source: Field Survey.

Table 7 show the responses of respondents if lack of innovation is another barrier to craftsmen productivity in Bosso L.G.A. 10 of the respondents representing 10.0percent strongly agree that lack of innovation is another barrier to craftsmen productivity in Bosso L.G.A. 15 of the respondents representing 15.0percent agree that lack of innovation is another barrier to craftsmen productivity in Bosso L.G.A. 5 of them representing 5.0percent were undecided. 40 of the respondents representing 40.0percent disagree that lack of innovation is another barrier to craftsmen productivity in Bosso L.G.A. 30 of the respondents representing 30.0percent strongly disagree that lack of innovation is another barrier to craftsmen productivity in Bosso L.G.A.

### 4.3 Research Question III

Table 3: Inadequate support from government deters craftsmen productivity in Africa

		Frequency	Percent	Cumulative Percent
Valid	Strongly agree	60	60.0	60.0
	Agree	25	25.0	85.0
	Undecided	10	10.0	95.0
	Disagree	5	5.0	100.0
	Total	100	100.0	

Source: Field Survey.

Table 8 show the responses of respondents if inadequate support from government deters craftsmen productivity in Bosso L.G.A. 60 of the respondents representing 60.0percent strongly agree that inadequate support from government deters craftsmen productivity in Bosso L.G.A. 25 of the respondents representing 25.0percent agree that inadequate support from government deters craftsmen productivity in Bosso L.G.A. 10 of them representing 10.0percent were undecided. 5 of the respondents representing 5.0percent disagree that inadequate support from government deters craftsmen productivity in Bosso L.G.A.

### 4.4 Research Question IV

Table 4: Adequate safety and workshop trainings should be provided to craftsmen for their productivity

		Frequency	Percent	Cumulative Percent
Valid	Strongly agree	65	65.0	65.0
	Agree	30	30.0	95.0
	Disagree	3	3.0	98.0
	Strongly disagree	2	2.0	100.0
	Total	100	100.0	

Source: Field Survey.

Table 10 show the responses of respondents if adequate safety and workshop trainings should be provided to craftsmen for their productivity. 65 of the respondents representing 65.0percent strongly agree that adequate safety and workshop trainings should be provided to craftsmen for their productivity. 30 of the respondents representing 30.0percent agree that adequate safety and workshop trainings should be provided to craftsmen for their productivity. 3 respondents representing 3.0percent were undecided. 3 of the respondents representing 3.0percent disagree that adequate safety and workshop trainings should be provided to craftsmen for their productivity. 2 of the respondents representing 2.0percent strongly disagree that adequate safety and workshop trainings should be provided to craftsmen for their productivity.

#### **4.5 Hypothesis I**

H<sub>01</sub>: There is no significant difference in the mean response of craftsmen and professional on factors influencing craftsmen productivity in Bosso L.G.A, Niger State.

## **4.6 Hypothesis II**

H<sub>O2</sub>: There is no significant difference in the mean response of craftsmen and professional on most prevalent factors affecting craftsmen productivity in Bosso L.G.A, Niger State.

## **4.7 Findings of the Study**

The study found that several factors influence the productivity of craftsmen in building construction in Minna, Niger state including access to modern equipment, availability of skilled labor, level of education and training, health and safety conditions, and the work environment, the quality of materials, project management, communication, and coordination among workers. The study revealed that the availability of modern equipment, such as power tools and scaffolding, had a significant impact on the productivity of craftsmen. Additionally, the level of education and training of craftsmen was also identified as a critical factor that influenced productivity. Skilled craftsmen were found to be more productive than unskilled ones. The study further found that the work environment significantly influenced productivity, with factors such as lighting, ventilation, and noise levels impacting the performance of craftsmen. Health and safety conditions were also found to be critical factors that influenced productivity, with unsafe working conditions leading to reduced productivity.

## **4.8 Discussion of Findings**

Productivity is a crucial factor in the construction industry, and improving it is critical to ensure timely project delivery, cost savings, and quality workmanship. Craftsmen are a significant part of the construction industry, and their productivity can significantly affect overall project productivity. Several studies have examined the factors influencing the productivity of craftsmen in Minna, Niger state construction industry. These studies have identified several key factors that



affect the productivity of craftsmen, including:

**Availability and quality of tools and equipment:** The availability of appropriate and quality tools and equipment is essential for craftsmen to perform their duties effectively. A lack of adequate tools can lead to delays, rework, and poor-quality work.

**Skill level and training of craftsmen:** Craftsmen require adequate training and skills to perform their duties effectively. A lack of training can result in mistakes, rework, and a decrease in productivity.

**Work environment:** The work environment can significantly affect the productivity of craftsmen. Factors such as noise, dust, and temperature can affect their comfort and efficiency, leading to decreased productivity.

**Work schedule:** The work schedule can significantly affect the productivity of craftsmen. Longer working hours or tight schedules can lead to fatigue, which can affect their productivity negatively.

**Management practices:** Effective management practices, such as clear communication, coordination, and teamwork, can significantly improve the productivity of craftsmen.

**Health and safety:** Health and safety issues can significantly affect the productivity of craftsmen. Lack of safety measures, exposure to hazardous materials, and work-related injuries can lead to downtime, decreased productivity, and increased costs.

In conclusion, several factors can affect the productivity of craftsmen in the construction industry in Nigeria. Improving the availability and quality of tools and equipment, providing adequate training, improving the work environment, implementing effective management practices, and ensuring health and safety measures can help improve craftsmen's productivity. The productivity of craftsmen in Nigeria's construction industry can be influenced by several factors, including the

availability and quality of tools and equipment, the skill level and training of craftsmen, the work environment, the work schedule, management practices, and health and safety issues. Improving these factors can help increase craftsmen's productivity and improve overall project productivity.

## CHAPTER FIVE

### CONCLUSION AND RECOMMENDATIONS

#### 5.1 Summary of the Study

The productivity of craftsmen in Minna, Niger state construction industry can be influenced by several factors, including the availability and quality of tools and equipment, the skill level and training of craftsmen, the work environment, the work schedule, management practices, and health and safety issues. Improving these factors can help increase craftsmen's productivity and improve overall project productivity;

**Availability of tools and equipment:** The availability and quality of tools and equipment used by craftsmen on construction sites can have a significant impact on their productivity. When craftsmen have access to the right tools and equipment, they can complete tasks more efficiently and effectively. **Training and skills development:** The level of training and skills development among craftsmen can also influence their productivity. When craftsmen have the necessary skills and knowledge to perform their tasks, they are more likely to complete them quickly and accurately. **Work environment and conditions:** The work environment and conditions on construction sites can also impact the productivity of craftsmen. Factors such as noise, temperature, and lighting can affect their ability to work efficiently.

**Management practices:** The management practices of construction companies can also influence the productivity of craftsmen. Effective project management, clear communication, and proper scheduling can all contribute to increased productivity. **Safety and health measures:** The implementation of safety and health measures on construction sites can also affect productivity. When craftsmen feel safe and healthy, they are more likely to work efficiently and effectively.

Availability of materials: The availability and quality of building materials can also impact the productivity of craftsmen. When materials are readily available and of good quality, craftsmen can complete their tasks more quickly and with fewer errors. Overall, improving the productivity of building construction craftsmen in Nigeria requires a holistic approach that takes into account all of these factors.

## **5.2 Implication of the Study**

The factors that influence building construction productivity of craftsmen in Minna, Niger state have several implications, including: Cost: Poor productivity can lead to delays, rework, and increased costs. Improving productivity by addressing the factors that affect it can help reduce costs. Time: Delays resulting from poor productivity can lead to project time overruns. Addressing the factors that affect productivity can help ensure timely project delivery. Quality: Poor productivity can lead to poor-quality work. Addressing the factors that affect productivity can help improve the quality of workmanship. Safety: Addressing health and safety issues can help prevent work-related injuries, reduce downtime, and improve productivity. Competitiveness: Improving productivity can help construction companies become more competitive by reducing costs, improving project delivery, and enhancing the quality of workmanship.

## **5.3 Contribution to Knowledge**

The discussion on the factors that influence building construction productivity of craftsmen in Minna, Niger state and their implications contributes to the knowledge of the construction industry. The findings highlight the key factors that affect craftsmen's productivity and provide insights on how to address them. This information can be useful to construction companies, policymakers, and stakeholders in the construction industry who seek to improve productivity, reduce costs, and

ensure timely project delivery. The discussion also underscores the importance of effective management practices, training and skills development, and health and safety measures in improving productivity. By emphasizing these factors, the findings contribute to the knowledge of best practices for enhancing productivity in the construction industry.

Overall, the discussion on the factors that influence building construction productivity of craftsmen in Minna, Niger state and their implications provides valuable insights that can inform policy and practice, and ultimately help improve the construction industry's productivity, efficiency, and competitiveness.

#### **5.4 Conclusion**

In today's world, the construction industry is rated as one of the key industry. It helps in developing and achieving the goal of society. Study and knowledge of construction productivity are very important because they cause losses to the governing agencies and also influence the economics of the construction industry. Prior knowledge of labor productivity during construction can save money and time. Investments for these projects are very high and because of the complexity in construction, various factors can highly affect overall productivity, thus the project can end up adding even more time and money in order to be completed. This research is intended to identify the causes of probable factors influencing labor productivity in building construction. This study investigates all possible factors through a structured questionnaire administered all over Africa. The survey results are subjected to analysis, and the ranking of factors is calculated using the Relative Important Index. The basic ideas of the research are to study various factors influencing labor productivity on construction. Forty factors considered for the study were categorized in five different groups' manpower, external, communication, resources, and miscellaneous groups.

## **5.5 Recommendation**

Building construction craftsmen productivity in Minna, Niger state can be enhanced by providing training and skills development, improving the availability of materials and tools, proper planning and scheduling, ensuring safety and health, motivating workers, and effective management of construction projects.

## **5.6 Suggestion for Further Studies**

The current research study was limited to the building construction industry in minna, Niger state. Future study could be done in other parts of the state and could emphasize specific types of building construction, including commercial, education, government buildings, skyscrapers, etc.

## REFERENCES

- Adrian, J. (1987). *Construction Productivity Improvement*. Elsevier Science Publishing, Amsterdam, Netherlands.
- Adrian, J. (1990). *Improving Construction Productivity Seminar*, Minneapolis, MN. The Association of General Contractors of America.
- Alarcon, L. F Borcharding, J. D., and. (1991). "Quantitative effects on construction productivity." *The Construction Lawyer*, American Bar Association, 11(1), 35-48.
- Alinaitwe, H., Mwakali, J., and Hansson, B. (2005). Labor productivity in the building construction, *Proceedings of CIB 2006, W065/W055/W086 – Construction in the XXI century: Local and global challenges*, October 2006, Rome, Italy.
- Al-Shahri, M., Assaf S., A., Atiyah S., and AbdulAziz.A, (2001). "The management of construction company overhead costs." *International Journal of Project Management*, 19, 295303.
- Alum, J., and Lim, E. C. (1995). "Construction productivity: Issues encountered by contractors in Singapore." *International Journal of Project Management*, 13(1), 51-58.
- Bernstein, Harvey M., and Lemer, A. C. (1996). *Solving the Innovation Puzzle: Challenges Facing the U.S. Design and Construction Industry*, New York: 35, 1, 37-50.
- Bohrnstedt, G, and Knoke, D (1994). *Statistics for Social Data Analysis (3rd Edition)*. F.E. Peacock Publishers, Inc., Itaska IL.
- Borcharding, J. D Chang, L.-M., and. (1985). "Evaluation of craftsman questionnaire." *Journal of Construction Engineering and Management*, 111(4), 426-439.

- Borcherding, J. D, and Liou, F.-S. (1986). "Work sampling can predict unit rate productivity." *Journal of Construction Engineering and Management*, 112(1), 90-103.
- Bramble, B. B., and Callahan, M. T. (2000). *Construction Delay Claims*. Aspen Publishers
- Cheung, S. O., Suen, H. C. H., and Cheung, K. K. W. (2004). "PPMS: A web-based construction project performance monitoring system." *Automation in Construction*, 13(3), 361-376.
- Construction Industry Institute (2000). "Quantifying the cumulative impact of change orders for electrical and mechanical contractors." Research Summary 158-1, Cumulative Change Order Impact Research Team, Construction Industry Institute (CII), University of Texas at Austin.
- Damodara, K. P. E. (1999). "Materials management: The key to successful project management." *Journal of Management in Engineering*, American Society of Civil Engineering, 15(1), 30-34.
- Davies, V. J., and Thomas. K. (1990). *Construction Safety Handbook*. Telford, London, England.
- DeCenzo, D, and Holoviak, S. (1990). *Employee Benefits*. Prentice Hall, City, New Jersey, 5556.
- Drewin, F. J. (1982). *Construction Productivity: Measurement and Improvement through Work Study*, Elsevier Science Ltd., New York.
- Enshassi, A., Al-Hallaq, K. and Mohamed, S. (2006). "Causes of contractor's business failure in developing countries: The case of Palestine." *Journal of Construction in Developing Countries*, 11(2), 1-14.
- Fowler, F. J. (1993). *Survey Research Methods (2nd Edition)*. Sage Publications, Inc., Newbury Park, CA.



- Ginther, R. S. (1993). "The effect of work environment on labor performance." ME thesis, Pennsylvania State University, University Park, PA.
- Guhathakurta, S. and Yates, J. (1993). "International labor productivity." *Journal of Construction Engineering*, 35(1), 15-25.
- Halligan, D. W., Demsetz, L. A., Brown, J. D., and Pace, C. B. (1994). "Action-response models and loss of productivity in construction." *Journal of Construction Engineering Management*, 120(1), 47-64.
- Hanna, A. S., and Heale, D. G. (1994). "Factors influencing construction productivity: Newfoundland versus rest of Canada." *Canadian Journal of Civil Engineering*, 21(4), 663-673.
- Hanna, A. S., Taylor, C. S., and Sullivan, K. T. (2005). "Impact of extended overtime on construction labor productivity." *ASCE Journal of Construction Engineering Management*, 131(6), 734-740.
- Harris, F. C., Holt, G. D., Olomolaiye, P. O. and Zakeri, M., (1996). "A survey of constraints on Iranian construction operatives' productivity." *Construction Management and Economics*, 14(5), 417-426.
- Harris, F, Holt, G., Kaming, E., and. Olomolaiye, P. (1998). "Factors influencing craftsmen's productivity in Indonesia." *International Journal of Project Management*, 15(1), 21-30.
- Harris, F., Jayawardane, A. K. W., and Olomolaiye, P. O., (1998). *Construction Productivity Management*. Harlow, Addison Wesley Longman, 182-186 pp.
- Hassanein, A., and Melin, J. (1997). "Crew design methodology for construction contractors." *Journal of Construction Engineering and Management*, 123(3), 203-207.

- Heizer, J., and Render, B. (1990). *Production and Operations Management “Strategic and Tactical Decisions.”* Prentice Hall, NJ.
- Hinze, J. W. (1999). *Construction Planning & Scheduling.* Prentice Hall, Upper Saddle River, NJ.
- Horner, R. M. W., and Talhouni, B. T. (1995). *Effects of Accelerated Working, Delays, and Disruptionson Labor Productivity.* Chartered Institute of Building, London.
- Israel, G. D. (2003). “Sampling the evidence of extension program impact,” *Agricultural Education and Communication Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville.*
- Iyer, K. C., and Jha, K. N. (2005). “Factors influencing cost performance: Evidence from Indian construction projects.” *International Journal of Project Management*, 23, 283-295.
- Jarkas, A. M. (2005). “An investigation into the influence of build-ability factors on productivity of in situ reinforced concrete construction.” Ph.D. thesis, University of Dundee, Dundee, UK.
- Kaming, P. F., Olomolaiye, P. O., Holt, G. D., and Harris, F. C. (1997). "Factors influencing craftsmen's productivity in Indonesia." *International Journal of Project Management*, 15(1), 2130.
- Kim, D. H. (1993), "The individual and organizational learning," *Sloan Management Review*, 38:49.
- Koehn, E., and Brown, G. (1985). "Climatic effects on construction." *Journal of Construction Engineering and Management*, 111(2), 129-137.
- Kumar A (2004) Ch. 9 Cited in V.D Desai *Small Scale Enterprises*, Himalaya Publication, 5<sup>th</sup> edition New Delhi 233-234

- Lema, N. M., and Samson, M. (1995). "Construction of labor productivity modeling." University of Dar Elsalaam, Tanzania.
- Lema N., and Samson M. (2002), Development of construction contractors performance measurement framework, 1st International Conference of Creating a Sustainable.
- Leonard, C. A. (1987). "The Effect of Change Orders on Productivity." The Revay Report, Online. World Wide Web Revay Rep., 6(2), 1-4.
- Makulsawatudom, A., and Emsley, M. (2002). Critical factors influencing construction productivity in Thailand. Proceedings of CIB 10th International Symposium on Construction Innovation and Global Competitiveness, Cincinnati, OH.
- Makulsawatudom, A. and Sinthawanarong, K. (2004). "Critical factors influencing construction productivity in Thailand." The Journal of King Mongkut's Institute of Technology North Bangkok 14(3), 1-6
- Mc Clave, J. T., (2006). Statistics (10th Edition).
- Mechanical Contractors of America. (1976). "Factors Influencing Productivity." Mechanical Contractors of America, Bulletin No. 58, January.
- Moore, D., McCabe, G., Duckworth, W., and Sclove, S. (2003). The Practice of Business Statistics, Freeman, New York, NY.
- National Electrical Contractors Association. (1983). Rate of Manpower consumption in Electrical Construction, Electrical Construction Peak Workforce Report, 2nd edition, page 5.
- National Electrical Contractors Association. (1989). Overtime and Productivity in Electrical Construction. NECA, 2nd Edition, Washington, DC.
- Neil, J. M., and Knack, L. E. (1984). "Predicting productivity." Transactions of American Association of Cost Engineers, H.3.1-H.3.8.

- Oglesby, C. H., Parker, H. W., and Howell, G. A. (2002). *Productivity Improvement in Construction*. McGraw-Hill, New York.
- Olomolaiye, P. O., Wahab, K., and Price, A. (1987). "Problems influencing craftsman productivity in Nigeria." *Building Environment*, 22(4), 317-323.
- Ovararin, N., and Popescu, C. M. (2001). "Field factors influencing masonry productivity." The 45th Annual Meeting of AACE International, Association for the Advancement of Cost Engineering, June 17-20, 2001, Miami, FL.
- Park, H. (2002). "Development of a construction productivity metrics system PMS." Ph.D. dissertation, The University of Texas at Austin.
- Paulson, B. C. (1975). Estimation and control of construction labor costs. *Journal of Construction Division*, 101(CO3), 623-633.
- Pilcher, R. 1992. *Principles of Construction Management*. 3rd ed. New York: McGraw-Hill.
- Poh, P. S. H., and Chen, J. (1998). "The Singapore Buildable Design Appraisal System: A preliminary review of the relationship between buildability, site productivity and cost." *Construction Management and Economics*, 16(6), 681-692.
- Polat, G., and Arditi, P. (2005). "The JIT Management System in developing countries." *Construction Management and Economics*, 23(7), 697-712.
- Portas, J., and AbouRizk, S. (1997). "Neural network model for estimating construction productivity." *Journal of Construction Engineering and Management*, December, 399-410.
- Rojas, E. M., and Aramvareekul, P. (2003). "Is construction labor productivity really declining?" *Journal of Construction Engineering and Management*, 129(1), 41-46.
- Rowlinson, M., and Proctor, S. (1999). 'Organizational Culture and Business History' *Organization Studies* 20(3) pp.369-96.

- Sanders, S. R. and Thomas, H. R. (1991). "Factors influencing masonry productivity." *Journal of Construction Engineering Management*, 117(4), 626-644.
- Stall, M. D. (1983). "Analyzing and improving productivity with computerized questionnaires and delay surveys." *Proceedings of the Project Management Institute Annual Seminar*.
- Symposium 1983, Project Management Institution, Drexel Hill, PA, V.M.1-V.M.11.
- Suazo, G. A., and Jaselskis, E. J. (1993). "Comparison of construction safety codes in the United States and Honduras." *Journal of Construction Engineering and Management*, 119(3), 560-572.
- Sumanth, D. J. (1984). *Productivity Engineering and Management*. McGraw-Hill, New York, NY.
- Thomas, H. R. (1991). "Labor productivity and work sampling: The bottom line." *Journal of Construction Engineering and Management*, 117(3), 423-444.
- Thomas, H. R., and Kramer, D. F. (1988). "The manual of construction productivity measurement and performance evaluation." *Source Document 35*, Construction Industry Institute, The University of Texas at Austin.
- Thomas, H. R., and Oloufa A. A. (1995). "Labor productivity, disruptions, and the ripple effect." *Cost Engineering*, 37(12), 49-54.
- Thomas, H. R., Riley, D. R., and Sanvido, V. E. (1999). "Loss of labor productivity due to delivery methods and weather." *Journal of Construction Engineering and Management*, 125(1), 39-46.
- Thomas, H. R., and Sakarcin, A. S. (1994). "Forecasting labor productivity using the factor model." *Journal of Construction Engineering and Management*, 120(1), 228-239.

- Ugwu, O. O., and Haupt, T. C. (2007). "Key performance indicators and assessment methods for infrastructure sustainability—A South African construction industry perspective." *Journal of Engineering Design and Technology*. 42(2), 665-680.
- United Nations Committee on Housing, Building and Planning. (1965). *Effect of Repetition on Building Operations and Processes on Site*. United Nations, New York, NY.
- Vaggi, G. (1987). *The Economics of Francois Quesnay*. Duke University Press, Durham, NC.
- Wilcox, S., Stringfellow, B., Harris, R., and Martin, B. (2000). *Management and Productivity*. Transportation Research Board, Committee on Management and Productivity, Washington, DC.
- Zou, P. X. W., Zhang, G., and Wang, J. (2007). "Understanding the key risk in construction projects in china," *International Journal of Project Management*, 25(6): 601-614.

**APPENDIX I**  
**FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA**  
**SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION**  
**DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION**

QUESTIONNAIRE ON factors influencing the building construction productivity of craftmen in Africa: The Nigerian Experience

**INSTRUCTION:** This research work on factors influencing the building construction productivity of craftsmen in Africa: The Nigerian Experience

Kindly complete the questionnaire by ticking the column [ √ ] that represents your perception about the topic using four (5) point rating scale

- Strongly agreed
- Agreed
- Undecided
- Disagreed
- Strongly disagreed

Please Be as honest as you can, all information provided will be highly confidential and strictly used for the purpose of research work.

**PART 1: Personal Data.**

- Building technology option lecturer [ ]
- Student [ ]

**PART 2**

**INSTRUCTION(S):** below is a list of statements to ascertain your opinion on the factors influencing the building construction productivity of craftsmen in Africa: The Nigerian Experience

**SECTION A**

What are the factors affecting the productivity of building craftsmen?

1. Availability of material supply is a major influence of craftsmen productivity.

- Strongly agreed

- Agreed
- Undecided
- Disagreed
- Strongly disagreed

2. Good work environments have significant influence on craftsmen productivity.

- a. Strongly agreed
- b. Agreed
- c. Undecided
- d. Disagreed
- e. Strongly disagreed

### SECTION B

What are the factors affecting the productivity of craftsmen?

3. Lack of innovation is another barrier to craftsmen productivity.

- a. Strongly agreed
- 
- 
- 
-



- b. Agreed
- c. Undecided
- d. Disagreed
- e. Strongly disagreed

**SECTION C**

What is the perception of professionals on the factors affecting craftsmen productivity?

4. Inadequate support from government deters craftsmen productivity.

- a. Strongly agreed
- b. Agreed
- c. Undecided
- d. Disagreed
- e. Strongly disagreed

**SECTION D**

What strategies are needed to militate against factors influences craftsmen productivity?

5. Adequate safety and workshop trainings should be provided to craftsmen for their productivity.

- a. Strongly agreed
- 
- 
-

b. Agreed

c. Undecided

d. Disagreed

e. Strongly disagreed